ELECTRICAL TIMES

THURSDAY
24 DEC.
1953
NINEPENCE

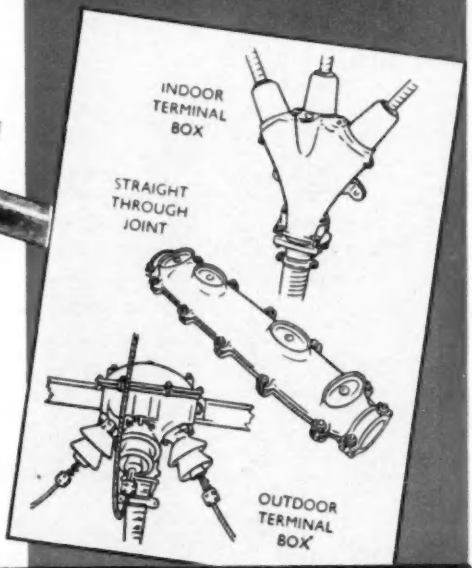
Henley's provide a dependable range of distribution equipment for indoor and outdoor installations.

Examples of equipment for 3,300 to 11,000 volts are illustrated below. Please write for catalogues in which you are interested.

Catalogue 31
Straight Through Joints

Catalogue 32
Indoor Terminal Boxes

Catalogue 33
Outdoor Terminal Boxes (Inverted)



HENLEY

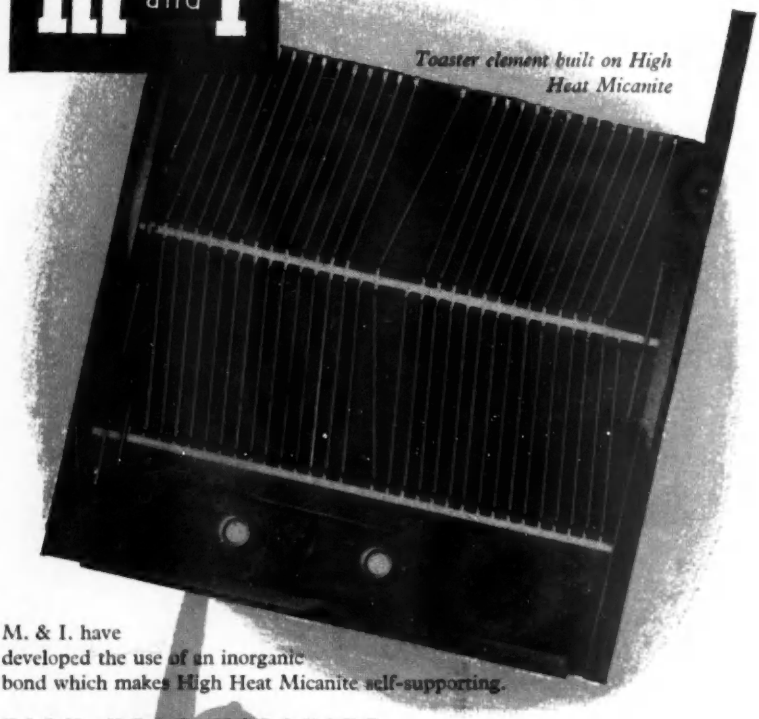
DISTRIBUTION EQUIPMENT
for 3,300 - 11,000 volts

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD. 51-53 HATTON GARDEN, LONDON, E.C.1

m and i

SELF-SUPPORTING HIGH HEAT MICANITE

for use in heating elements



Toaster element built on High Heat Micanite

M. & I. have developed the use of an inorganic bond which makes High Heat Micanite self-supporting.

HIGH HEAT MICANITE

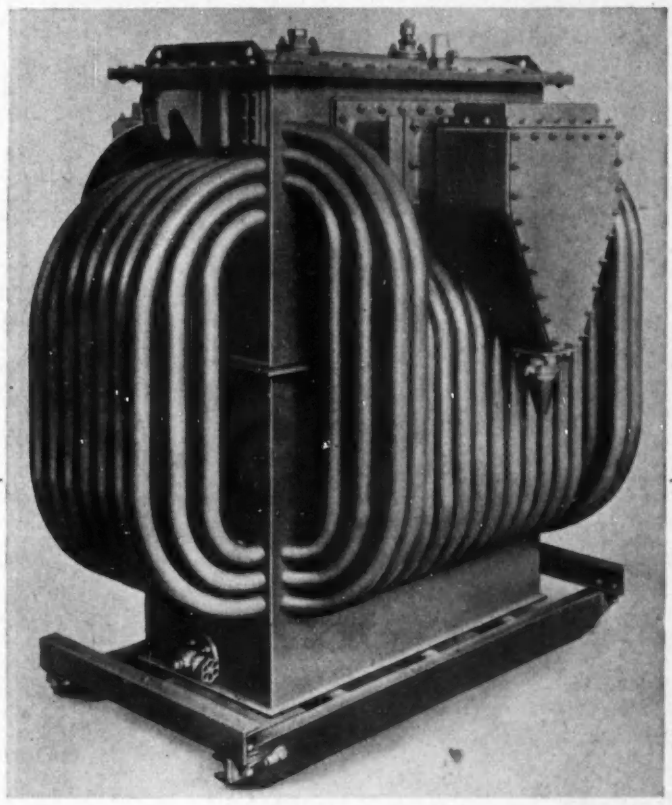
1. Maintains its electrical properties at high temperatures.
2. Is suitable for unsupported electrical heating elements such as toasters, surface heaters, all types of resistances and heating elements on domestic voltages where the temperature of the micanite does not exceed 500°C.
3. Is produced in thicknesses up to 0.060″: density 2.4 to 2.5. (To ensure adequate mechanical strength a minimum thickness of 0.020″ is recommended.)
4. Is produced in flat pieces only (cannot be shaped or moulded).

As the machining of High Heat Micanite requires special facilities and experience, M. & I. prefer to supply it in pieces cut to size and ready for use.

THE MICANITE & INSULATORS CO. LTD., Empire Works, Blackhorse Lane, Walthamstow, London, E.17. BRANCH OFFICES AT BIRMINGHAM, CARDIFF, GLASGOW, MANCHESTER and NEWCASTLE-UPON-TYNE and representatives in most countries throughout the world.

Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. PANILAX Laminated Materials and Mouldings. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS and TERMINALS. Distributors of Micoflex-Duratube Sleevings, Micoflex-Durasleeve (Plastics-covered flexible metal conduit) and Kenutuf Injection Mouldings (in most thermo-plastics including P.V.C.).

Substation transformers to British Electricity Specification T.1 for early delivery



'ENGLISH ELECTRIC'

transformers

THE ENGLISH ELECTRIC COMPANY LIMITED, Queens House, Kingsway, London, W.C.2

Transformer Department, East Lancashire Road, Liverpool, 10

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

TL.6

See the English Electric advertisement for Polyphase Motors which appears on page 49 of this issue

A

'HAWKE' IMPROVED COMPRESSION TYPE CABLE GLANDS AND SEALING BOXES FOR ALL TYPES OF CABLE

- **Cables can be installed quickly**
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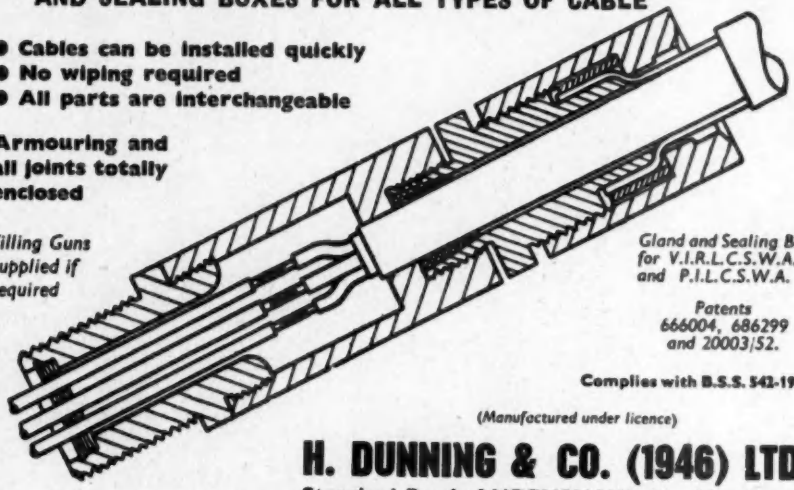
- **All parts are interchangeable**

Armouring and all joints totally enclosed

Filling Guns supplied if required



Gland and Sealing Box for V.I.R.L.C.S.W.A./S and P.I.L.C.S.W.A. S.

Patents 666004, 686299 and 20003/52.

Complies with B.S.S. 542-1947

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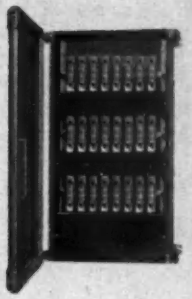

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15 AMPERE FUSES 250 VOLTS
20 " " 440 "
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MANCHESTER 3 — H. NICHOLLAND, WOOD STREET.
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£6.16.5 (inc. tax)

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No. 751 1kW size
(1 unit per hour)
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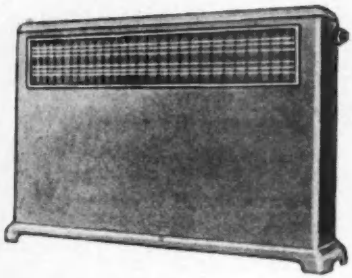

Finish: Rippie Bronze

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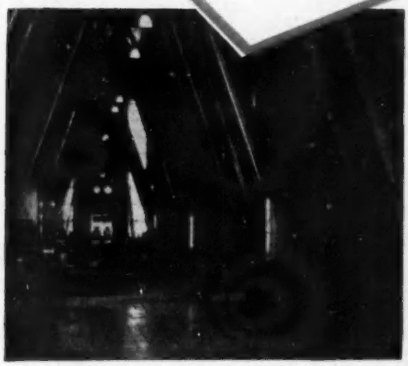
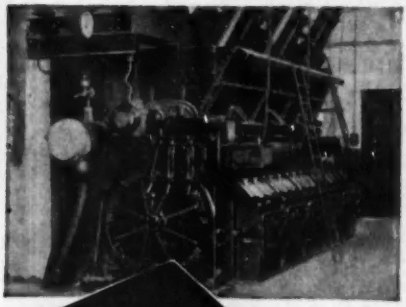
In power stations



Firing aisle showing twin 'L' stokers at an Electricity Generating Station.

Small 'L' stoker installation at a Chemical Works.



and in factories

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for rural distribution

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- No maintenance costs. Stoneware containers are salt and acid proof and the supporting steel work is heavily galvanised. Hermetically sealed container protects oil from acidity.
- Increased efficiency plus reduced operating costs due to low losses.
- High Overload Capacity.
- Simple installation—only one or two bolts required.

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Photograph shows typical rural transformer installation on Eastern Electricity Board System.

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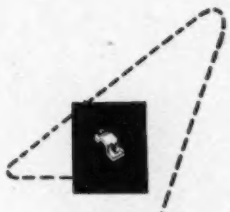

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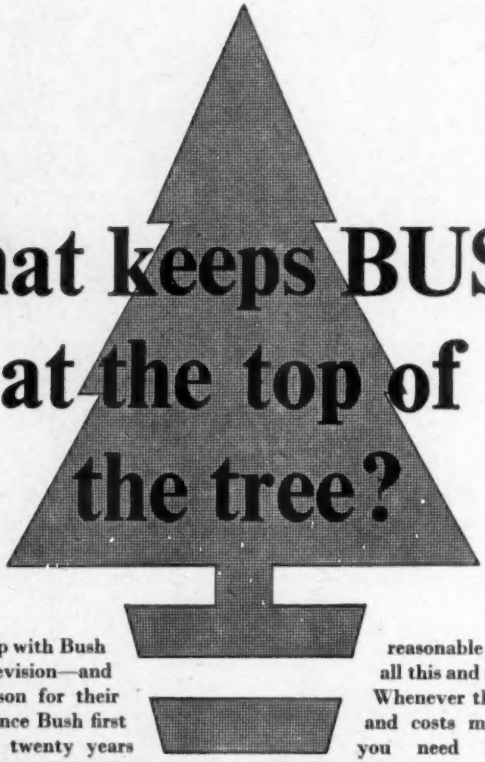
What keeps BUSH at the top of the tree?



So MANY end up with Bush in radio and television—and have good reason for their choice. Ever since Bush first took root over twenty years ago their designers have been putting some of the radio industry's most progressive thinking on their drawing boards. They have also shown a consistent choosiness about materials. The stuff has to be pretty good to be good enough for Bush.

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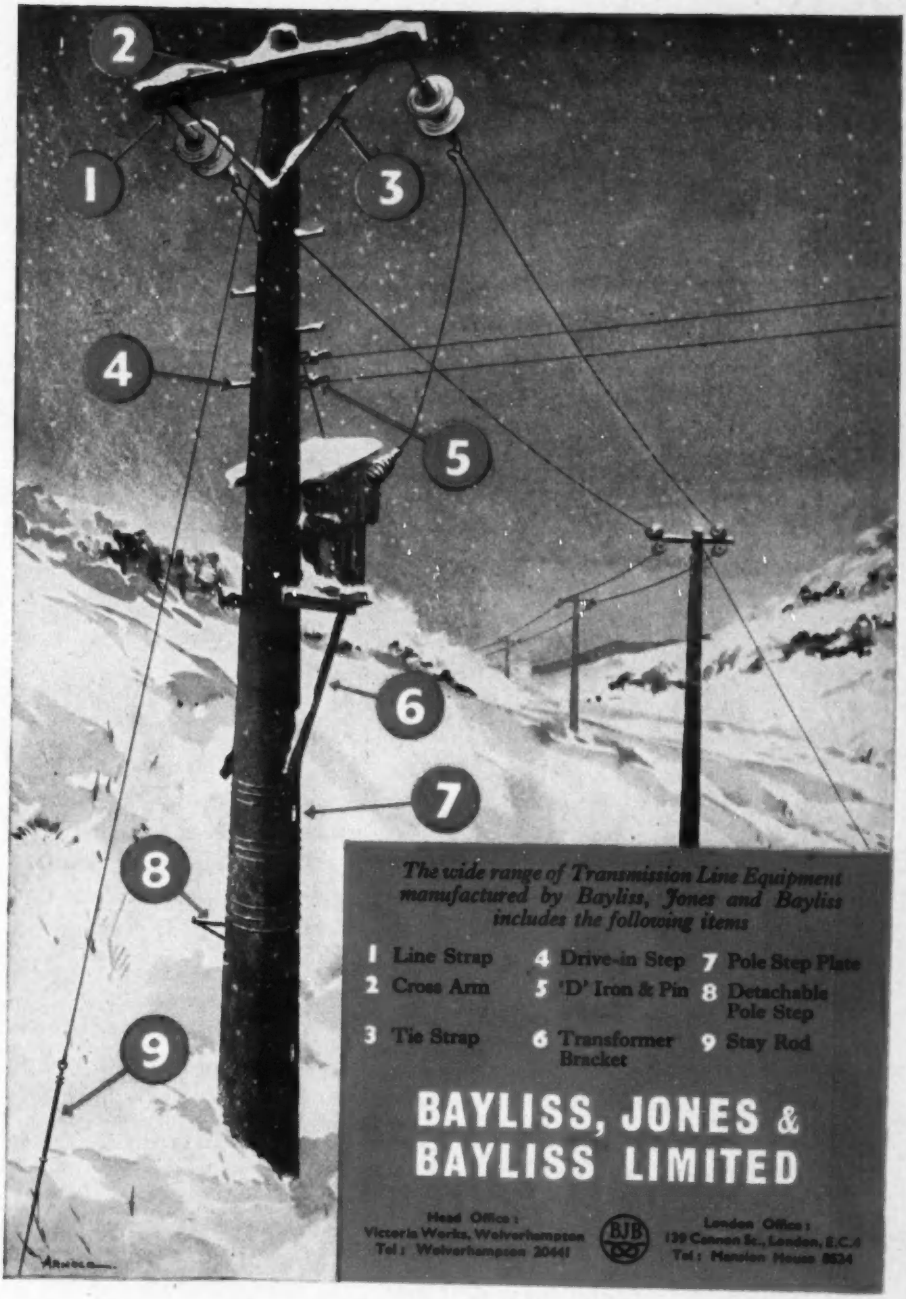
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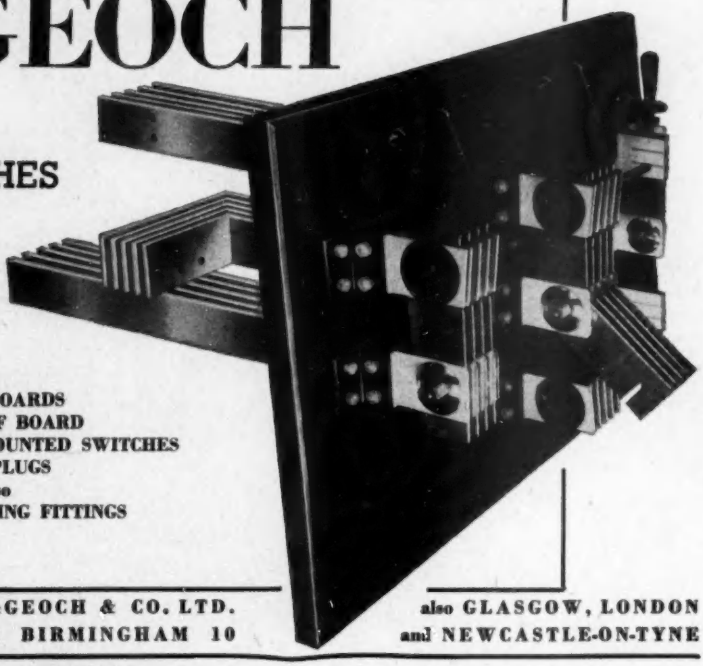

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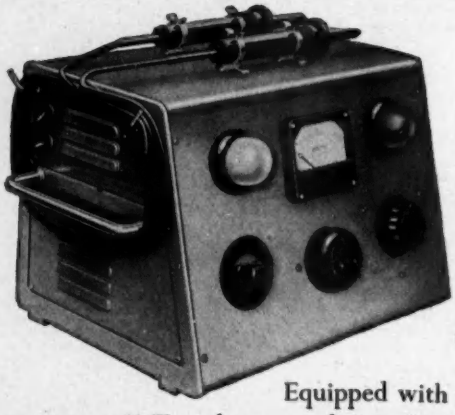

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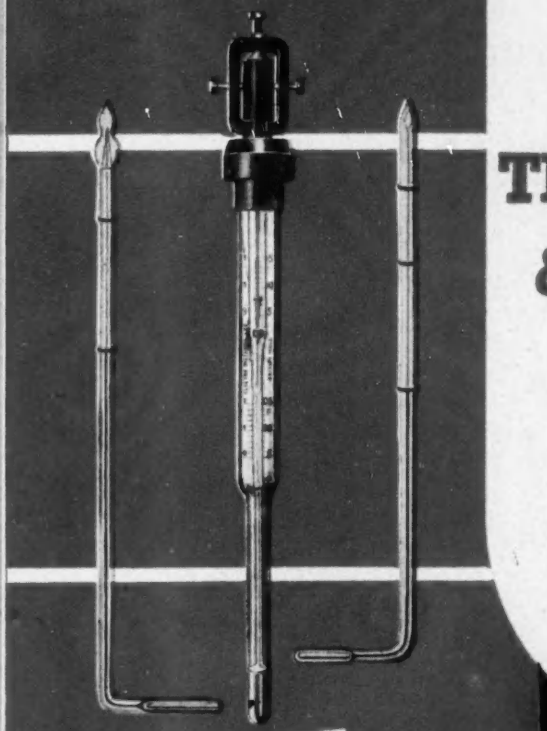

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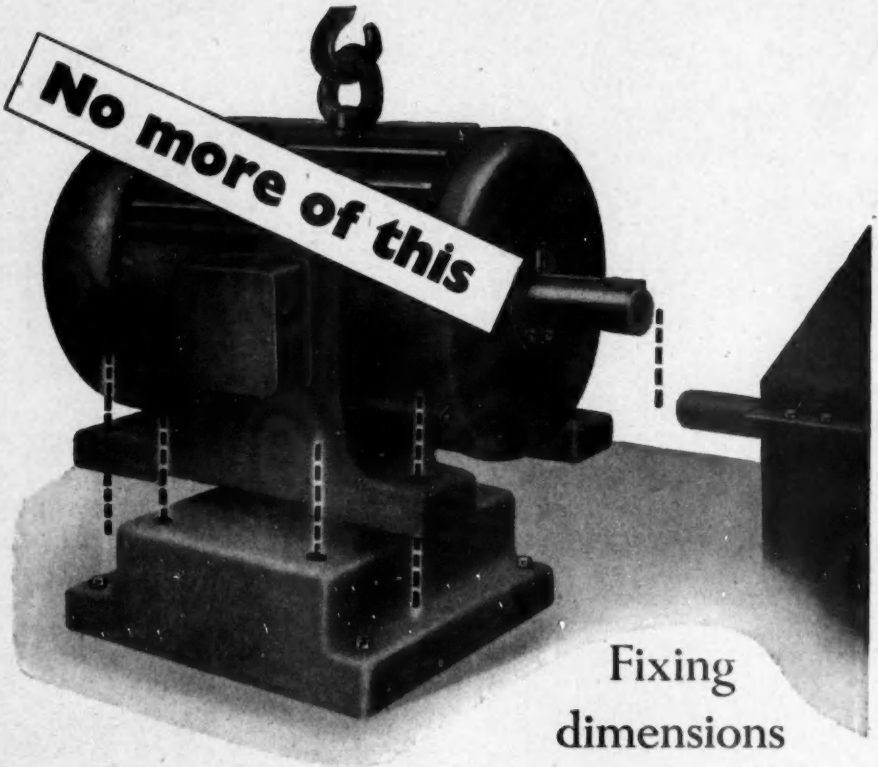
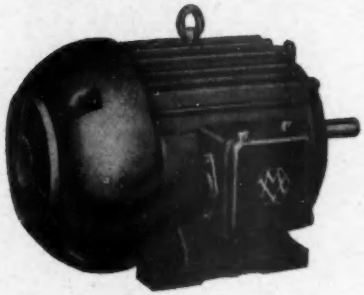


Fixing dimensions standardized

Leading motor manufacturers in this country have collaborated in the design of a range of totally-enclosed fan-cooled, foot mounting, squirrel cage motors having outputs from ¾ h.p. up to 25 h.p. These machines, rating for rating, will all be built to the same leading dimensions which will be laid down in a British Standards specification. This move to standardise motor fixing dimensions meets a widespread demand and will ensure that when motor replacement is necessary, lost production time is reduced to a minimum.

METROVICK are manufacturing a new range of machines which comply fully with British Standard Draft Specification CN(ELE) 6814. The M.V. range is known as:



One of the totally enclosed, fan-cooled, Type KNB motors with standardized fixing dimensions.

TYPE KNB MOTORS

Send for Descriptive Leaflet 26/1b-1

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Member of the A.E.I. group of companies

METROVICK *motors ready for world-wide service*

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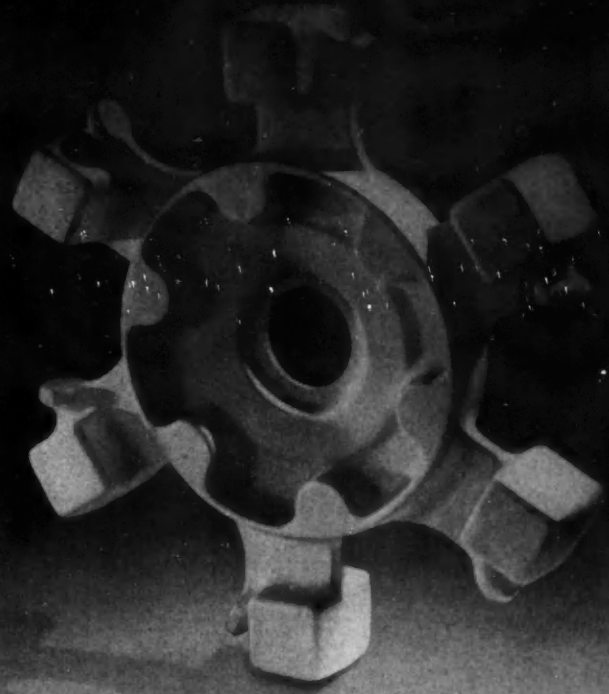
Take the advantages of Aluminium – lightness, strength, workability, resistance to corrosion.

Add to these the special skills, the research facilities and vast experience of High Duty Alloys and . . .



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Regd. Trade Mark

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M-W. 547

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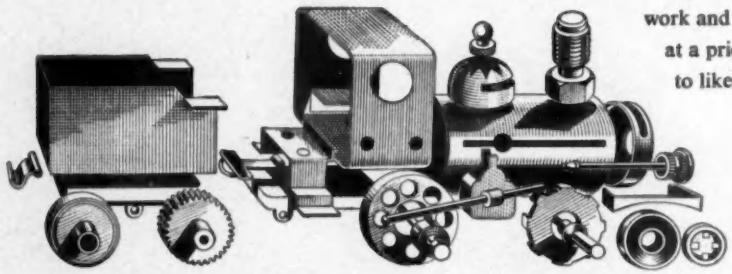

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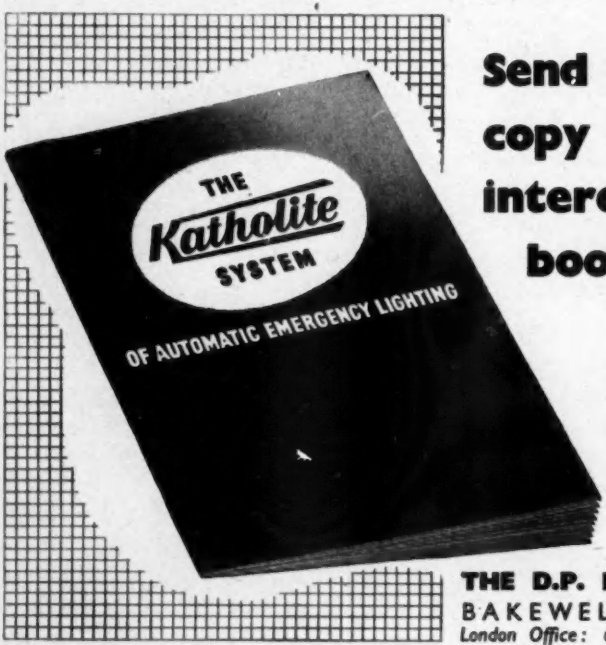

Send for a copy of this interesting booklet . .

The information and circuit diagrams embodied in this new publication should prove most useful to engineers and others who are interested in Emergency Lighting—please ask for publication No. D.P. 814.

THE D.P. BATTERY CO. LTD.
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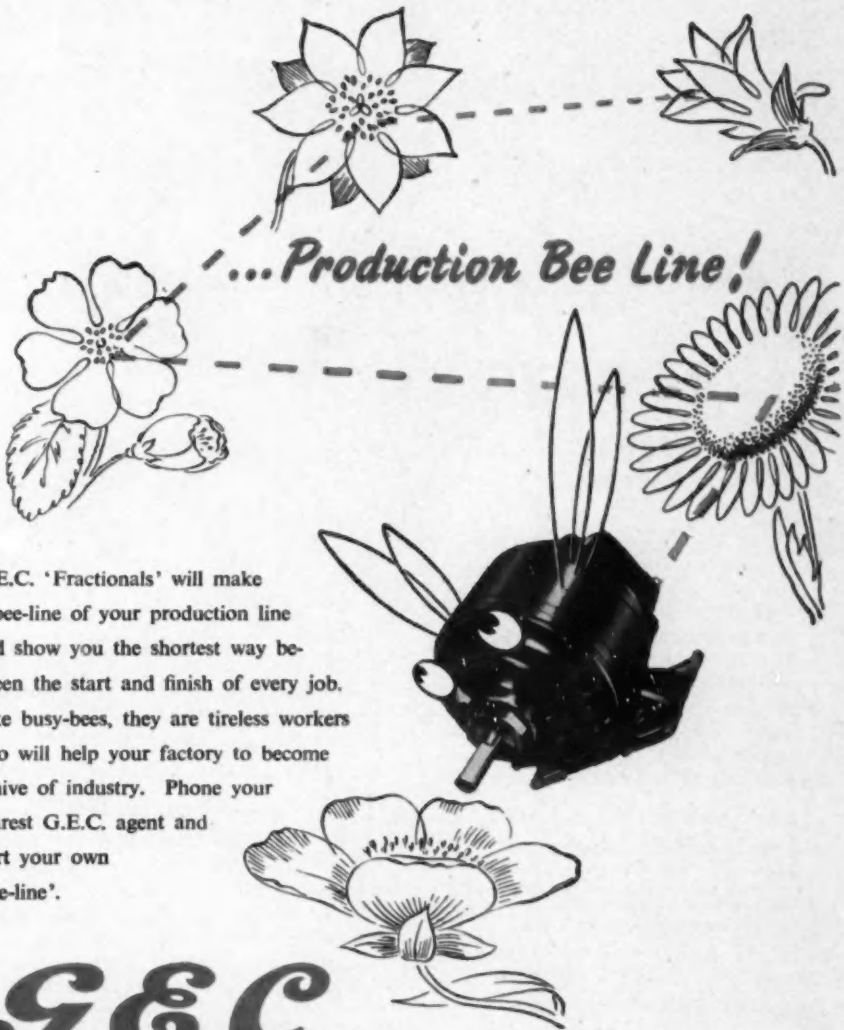
J.248



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G.E.C.

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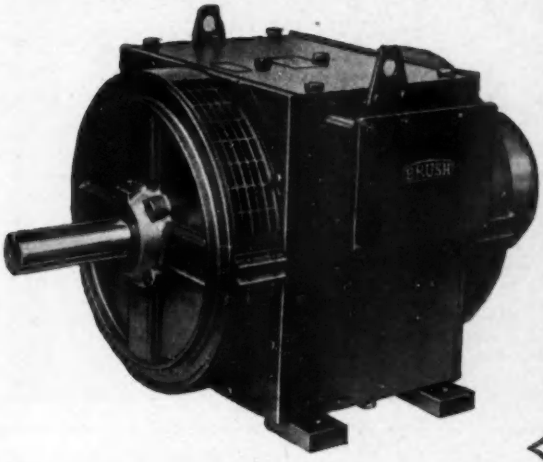

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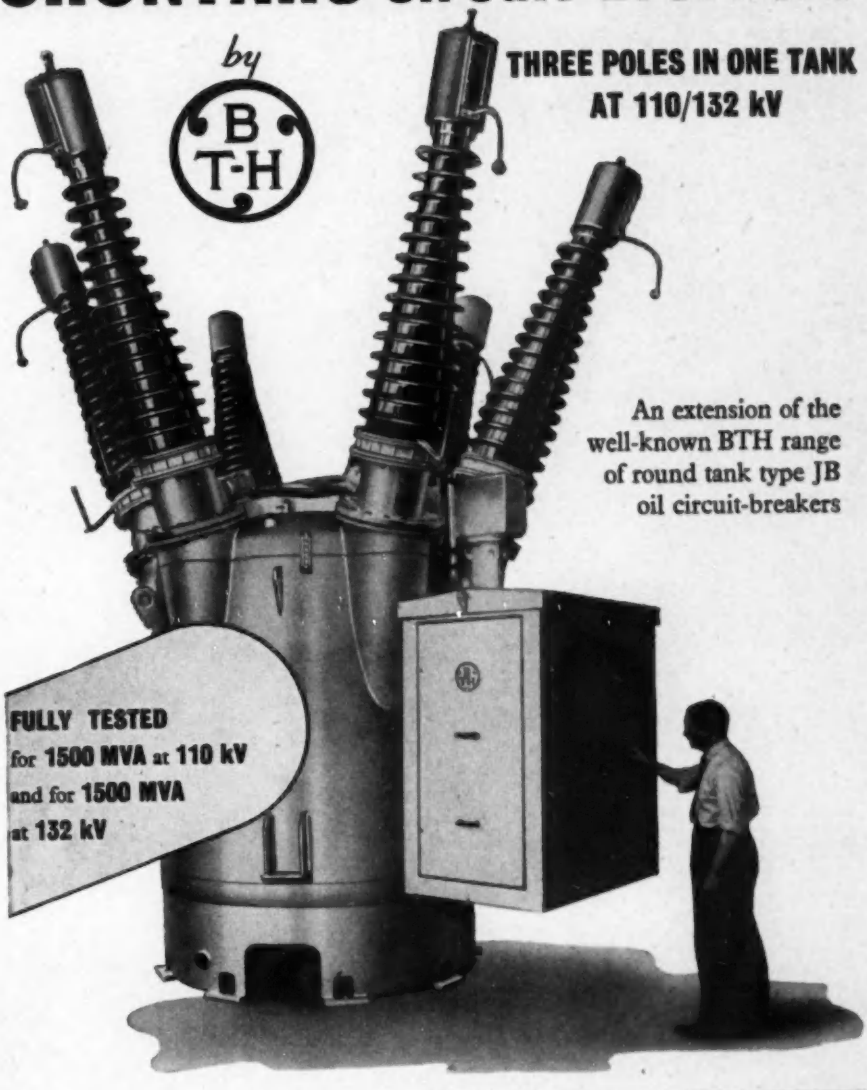

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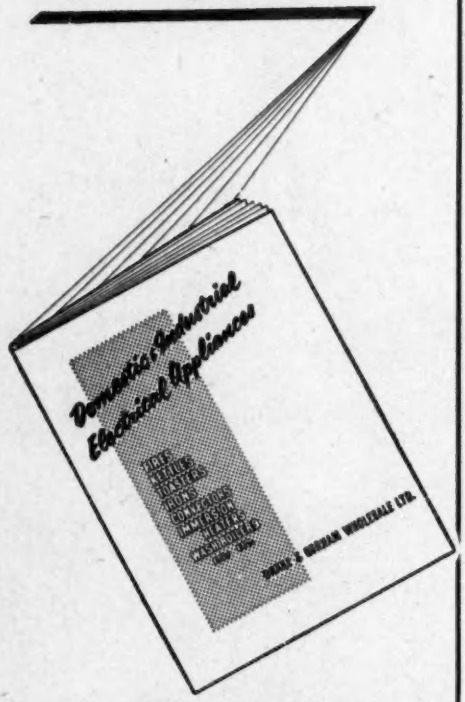

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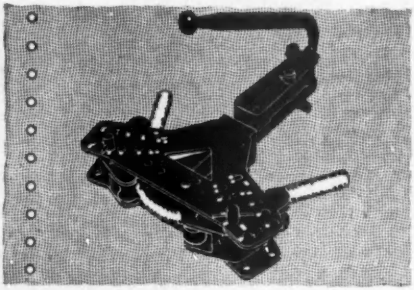

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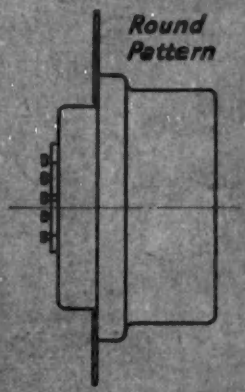

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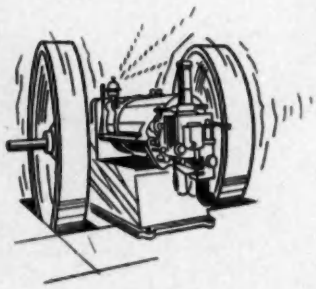

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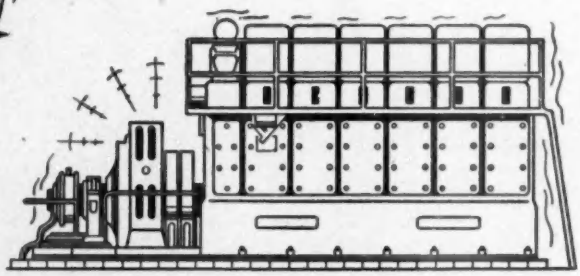

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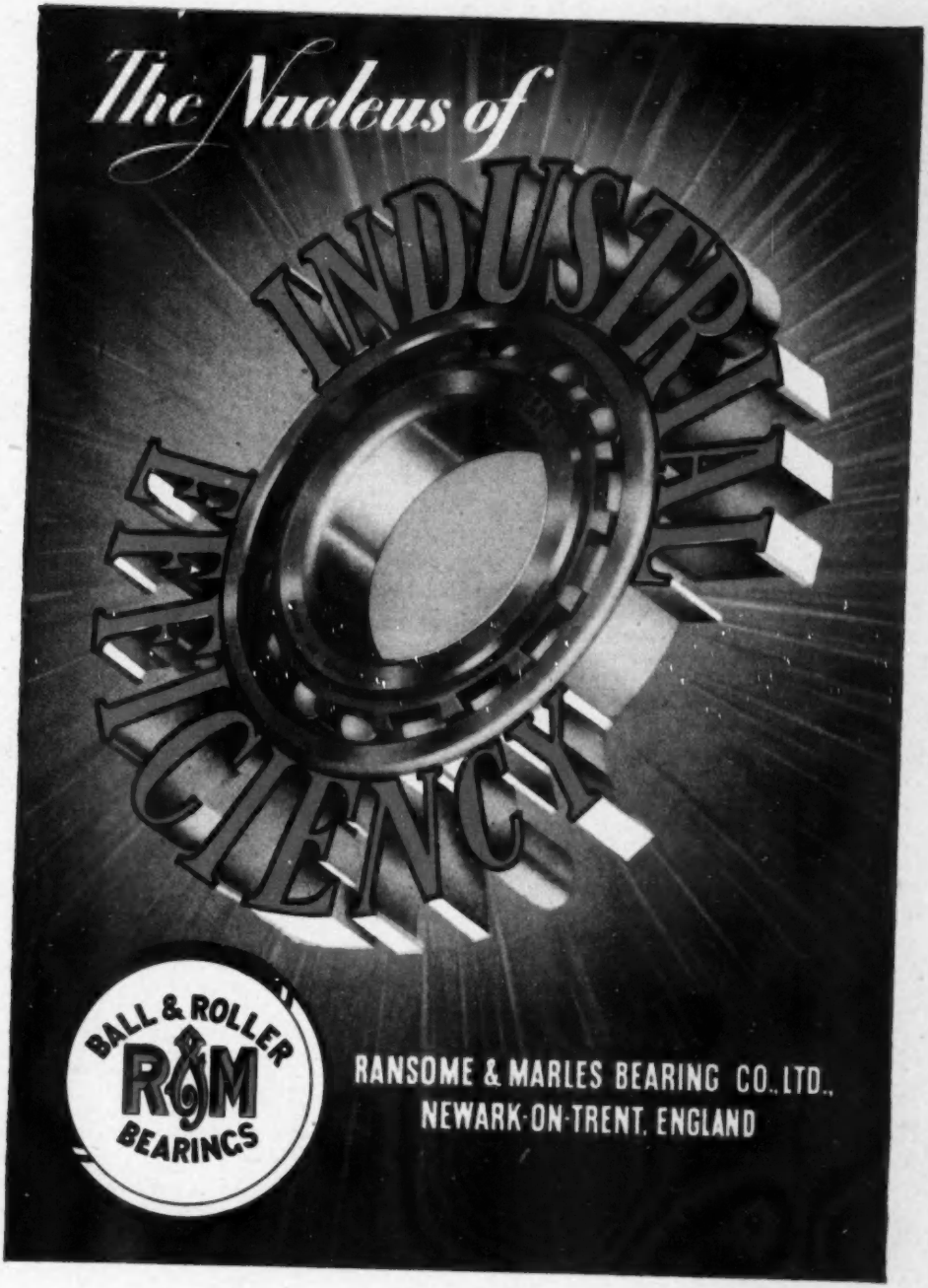
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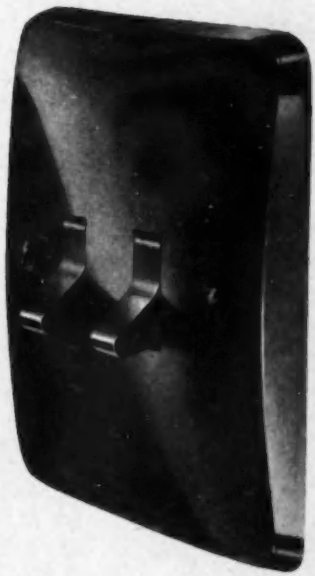

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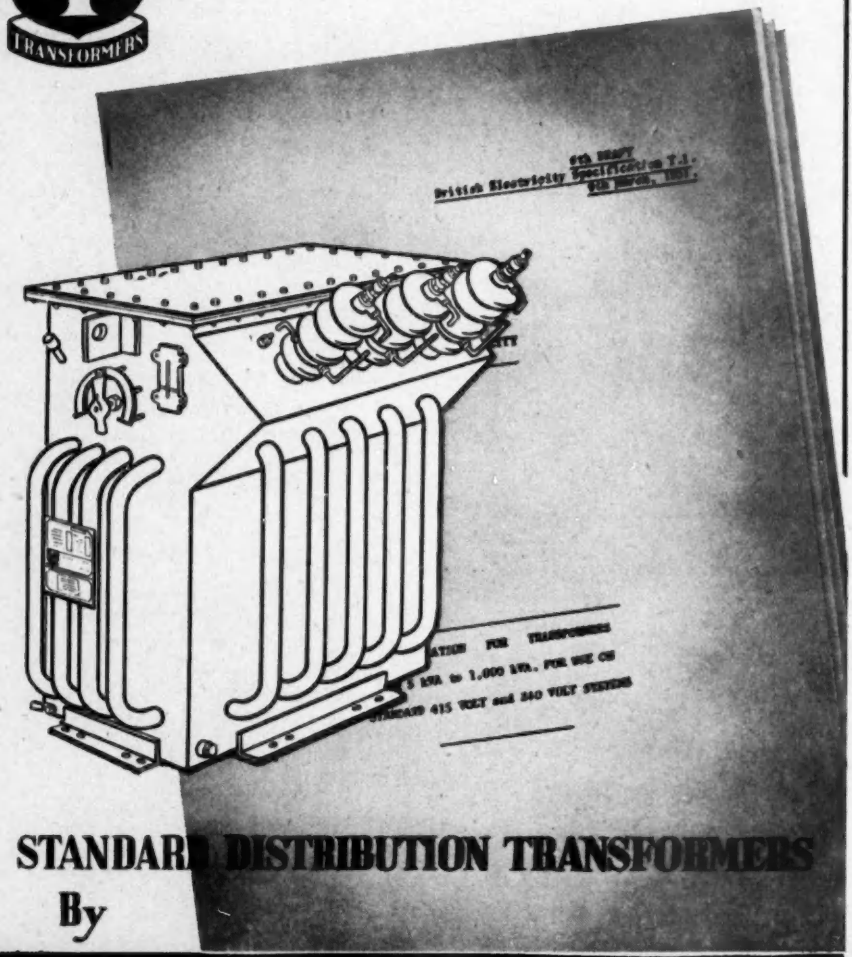

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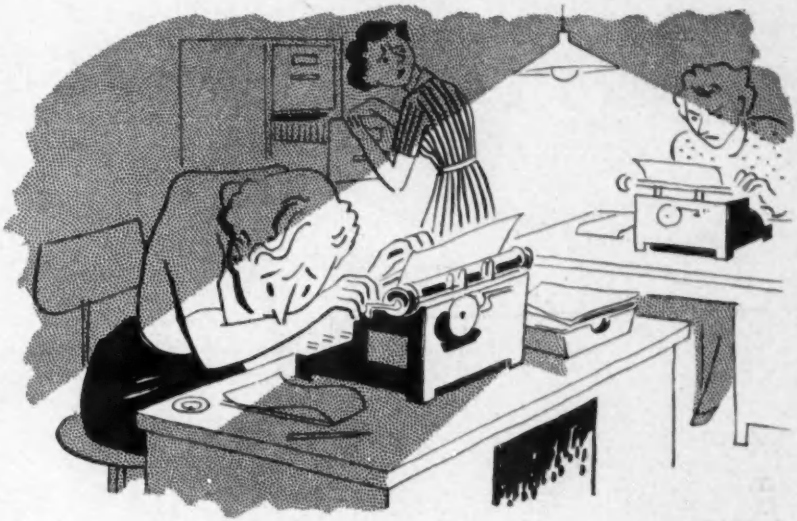

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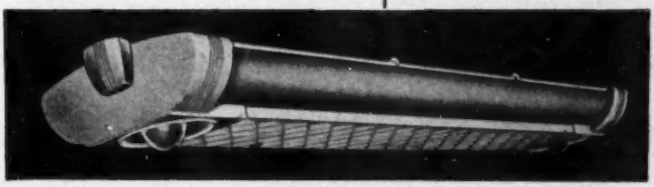

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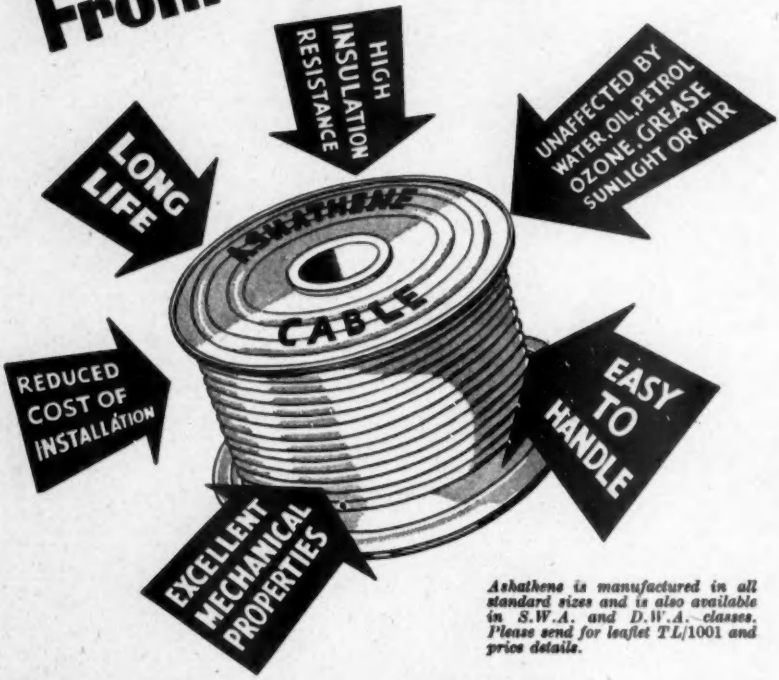

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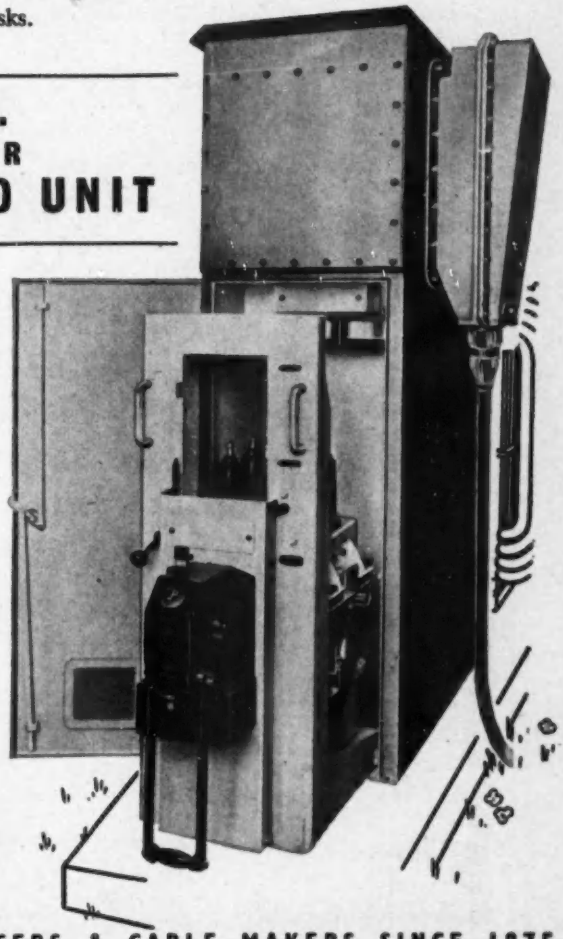

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ELECTRICAL TIMES

Volume 124 No. 3242 24 DECEMBER, 1953

PUBLISHED EVERY THURSDAY

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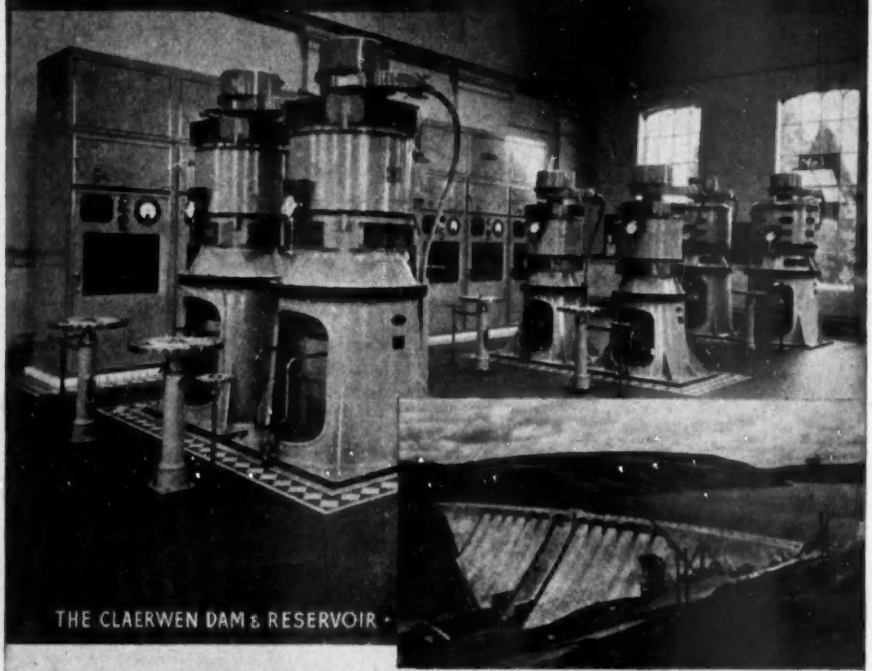

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Editorial

FURTIVE ATOMICS

LAST week's brief House of Lords debate on the Government's atomic energy plans had its main interest in the estimate given of what the first nuclear-generated electricity available in this country may cost. This is 1d. per unit at the station busbars, using the relatively low efficiency steam cycle imposed by present limitations on the materials of construction used in the nuclear reactor. Improvements may be expected as experience grows, and the estimated cost can be regarded as promising. But how soon these necessary improvements will in fact be brought about, depends to some extent on another question which Lord Falmouth raised in his introduction to the debate. How far is unnecessary secrecy holding up development? It is acknowledged that information appertaining to the military use of atomic energy must be closely guarded; but this security complex has so thoroughly established itself that it has spread to many matters which can only be of interest for power production purposes. Why else is it that most of the books dealing with the subject are American; or that when, as they do too rarely, British atomic engineers speak in public they quote so much from American publications? A change in this policy is needed, and it should be one of the aims of the proposed new Authority to bring this about. In the result, more minds thinking around the known facts should speed that improvement in efficiency on which the hope for the future so much depends.

INDEFINITE REGULATIONS

ANY factory electrical installation of 1908 would seem a very strange sight today; yet as the article by Mr. H. W. Swann on a later page reminds us, today's fluorescent lighting installations and electronic control equipment are subject to the same set of regulations that governed the cruder

The Editor
Wishes You
A Merry Christmas

wiring systems and relatively few motors of the Edwardian era. That this is so is a remarkable tribute to those who framed the original code of regulations, and kept sufficiently close to fundamental principles to enable advances undreamed of in the first decade of this century to be embraced without the need for modification. Yet even to point this out is to give a reminder that one day, the regulations will inevitably require revision. The growing use of electronics in factories, which so modifies the concept of earthing may be the occasion for this, or perhaps some technical advance will render inappropriate the wide-sweeping exemptions which at present precede the regulations proper. However this may be, when the time for revision comes, there will be a hard decision to be taken. Shall the present flexibility and broadness be retained, or shall a more closely tailored code narrowly defining approved practice be substituted?

OPEN ADVANTAGES

IN the many discussions that have taken place in the technical Press and at meetings on the topic of outdoor generating stations, the accent has been on the savings in cost that can result from elimination of enclosures for power station plant. The whole of American claims have been in this direction, and figures of several pounds per kilowatt installed have been bandied about. With the Ince station of

the B.E.A. now well advanced, it appears that the saving in cost is likely to be marginal only, especially when certain increased running expenses are taken into account. Yet in spite of this experience, the Ince project is not a disappointment. If the expected advantages have proved to be less than was at one time expected, others have taken their place. Quicker constructional times are a most acceptable feature, while the prospect of better working conditions for boiler house staff is as welcome as it is at first sight unexpected. To these points, two others must be added before any judgment is offered on the result of the Ince experiment. Firstly, it has to be kept in mind that the station is in the nature of things, a somewhat tentative approach to the possibilities of outdoor construction. Secondly, that the larger sets envisaged, with their demand for ever taller unit boilers, will offer increased opportunities for the direct savings which first attracted attention to outdoor construction.

UNFORTUNATE EXPERIMENT

THE long-awaited paper giving the operational results of the large-scale heat-pump experiment carried out at the Festival Hall, London, is in many ways, disappointing. The fundamental purpose of the project, to gain economic and technical data on which future schemes could be based, was only partially achieved, and the final conclusions drawn had consequently to be based on several assumptions the validity of which are open to some doubt. Where the trouble lay was not in the heat pump itself, which on the whole behaved satisfactorily, but in the well-nigh incredible overestimation of the peak demand for heat required by the Hall. With an estimated figure given as 26 million B.Th.U./hr to be provided, the Ministry of Fuel and Power scientists were justified in assuming that to design for a heat-pump output of some 9 million B.Th.U./hr would be well below even the average requirement and, in conjunction with the existing heating system, that they would thus have a steady base load from which they could derive accurate performance data. In the event, even 9 million B.Th.U./hr was far in excess of the peak load, and in such circumstances the unit was never operating under stable conditions of temperature, nor could it run for any length of time at maximum efficiency. Despite this, however, the experiment brought out quite clearly that the system, as used for building heating, has considerable economic advantages, among which is its faculty of acting as a refrigerator during periods of hot weather.

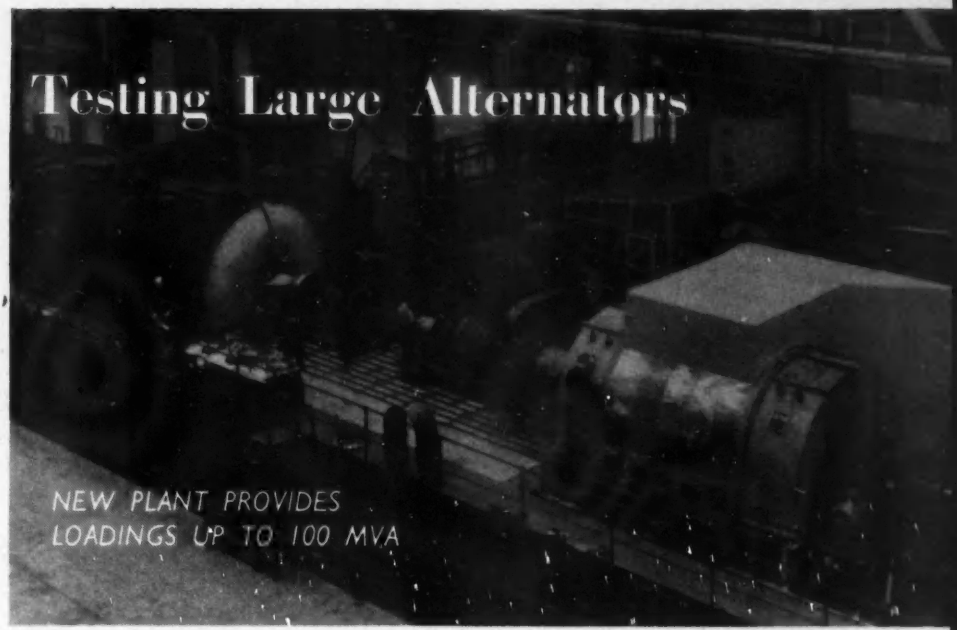
The ELECTRICAL TIMES *will be restyled throughout in quarto format from the first issue in January next*

SUFFICIENT SAFETY

PERMIT-TO-WORK procedures are a well-established part of the technique of electrical engineering wherever high voltage is in use. Within its limitations, this system, if faithfully carried out, largely guarantees the safety of those involved in working on the high voltage apparatus concerned. Unfortunately, as the latest of the Electrical Factory Inspectorate's reports on electrical accidents points out, the greatest danger is usually present before the permit-to-work becomes operative. The permit commonly certifies that the apparatus concerned has been made dead and earthed; it is this preliminary work on apparatus that may be alive that is fraught with special danger, even though it is carried out by senior, experienced engineers. The suggestion made in the report is, in its essentials, that the procedure for earthing, and especially the sequence in which the operations are to be carried out, should be formally set down beforehand, rather than decided on the job. This seems on the face of it a reasonable enough proposal, especially as it is backed by experience of several serious accidents which the proposed method of working might have prevented.

Meteor

Testing Large Alternators



NEW PLANT PROVIDES LOADINGS UP TO 100 MVA

THE testing of large alternators in the shops has always proved to be a somewhat difficult problem. Ideally, the most suitable method would be to test the machine with its associated prime mover, on load, but with the large sizes of set now being built such a proceeding is, of course, impossible. A compromise, however, which provides the equivalent of full testing is to connect the machine to a reactive load which has virtually zero power factor. Under these circumstances, the alternator can be tested up to full current and voltage, the drive merely supplying the losses in the machine and load. Here the difficulty lies in providing the load. In some cases, this can be done by using a number of over-excited synchronous machines to act as synchronous condensers, but this depends on the availability and size of such machines. A simpler, and more effective method is to use saturable reactors, as adopted in the Witton Works of the General Electric Co. A demonstration of this test section in operation was held last week before members of the B.E.A. and representatives of consulting engineers.

The actual test bed itself is located in the heavy alternator shop at Witton and is so arranged that one machine can be erected or dismantled while a second is on test. The general appearance of the test bed is illustrated above, where it can be seen that the driving motor is mounted on a central raised platform, and can be connected to machines erected on either side of it. Each of the alternator test positions is fully equipped with a closed circuit ventilation system for either air or hydrogen cooling and is arranged to support the stators and rotors of steam turbine driven alternators, ranging in output from 12 MW to 200 MW. As the alternator is erected on the test bed independently of its foundation plates, work on the foundation arrangements on site can proceed simultaneously with the testing of the machine.

To provide the driving power is a 3,000 h.p. two-pole induction motor which draws its power normally from the 11 kV incoming supply through step-down transformers. Two induction regulators are provided and in addition there is a large remotely operated liquid controller. With this equipment a 60 MW machine can be run up to speed in about five minutes and shut down in about four minutes. If additional power is required for the extra large alternators, a second motor can be arranged to run in tandem with the existing one.

Particular attention has been paid to the lubrication system. Oil for the bearings and the hydrogen seal is fed from a 2,500-gallon

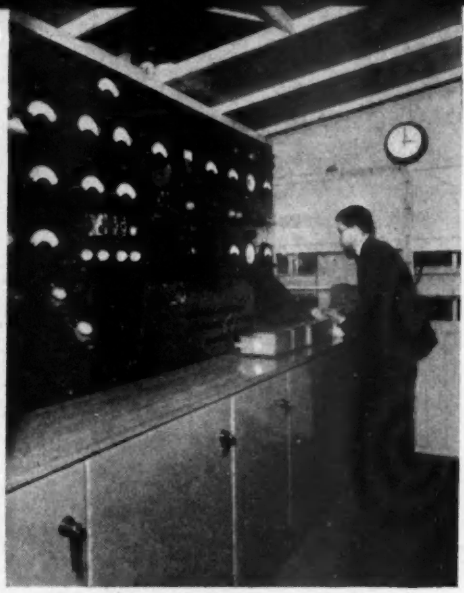
reservoir in which the oil is maintained under an air pressure of 60 lb/sq in. The pressure and the flow of oil are maintained by screw-type pumps, independently driven by squirrel cage motors. In the event of a failure of the supply, the motors are automatically switched to a separate emergency supply. Should this supply also fail, or the pumps themselves break down, the capacity of the reservoir is adequate to permit an alternator of the largest size to be brought to rest in safety.

Heat generated in the alternator and in its bearings is dissipated in water coolers. As the volume of water may approach 2,000 gallons per minute, a closed water circuit is adopted, the water itself being cooled in forced draught spray coolers before being recirculated. In hydrogen cooled machines, the heat exchangers are built into the sides of the stator, but for air-cooled alternators a separate test cooler system is provided.

For test purposes the hydrogen control is entirely manual and is kept as simple as possible, the instruments comprising a purity meter, pressure gauge and an inclined oil gauge of the "U" tube type which indicates the fan pressure and also gives an indication of hydrogen purity.

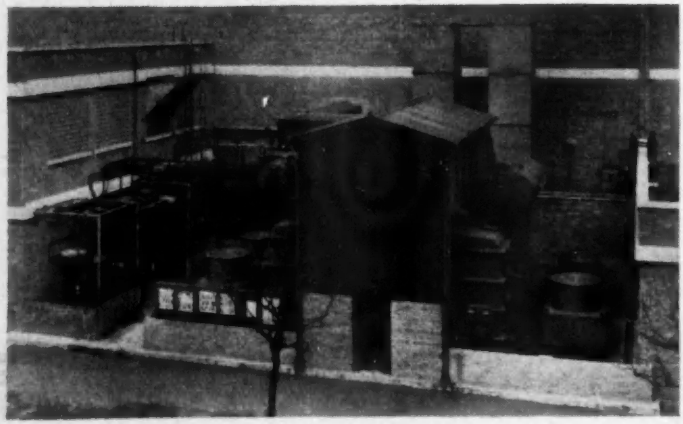
Loading Reactors

The most important items of the test system are, of course, the two saturable reactors. These are situated in the open adjacent to the test substation and are arranged for forced oil cooling, the oil coolers, which are of the forced-draught type with integral fans, being mounted alongside. The reactors normally absorb only 500 kVA, but by saturating the cores with d.c. through auxiliary windings this figure can be raised to 100 MVA. Each reactor has a six-limbed core, carrying in addition to the main windings and saturating d.c. windings, tertiary windings which are so arranged that the current drawn from the alternator undergoing test is practically sinuosoidal. Tests on the plant have shown that the waveform has a maximum harmonic content of the order of 1½%. This system of d.c. excitation enables extremely smooth control of loading to be obtained, and by means of external flexible links, the reactors can be arranged to provide maximum loadings of 75 MVA at 11 and 22 kV, or 37 MVA at 6·6 kV.



Interior of control room showing permanent instruments

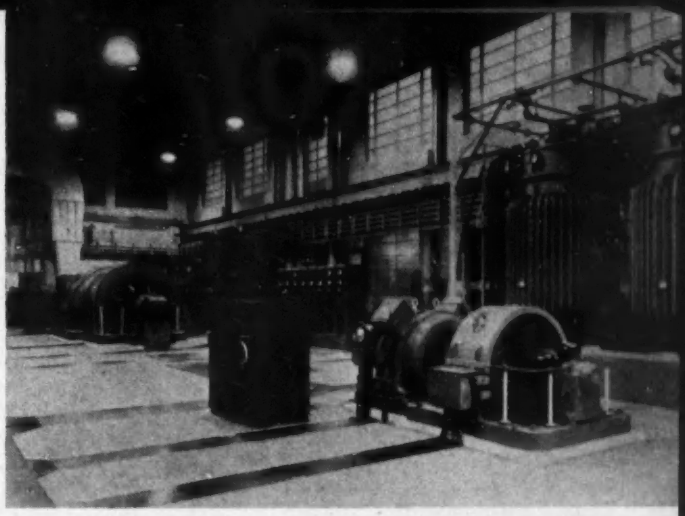
D.C. excitation is obtained from a twelve-phase grid-controlled rectifier of the pumpless steel tank type, the output voltage of



The outdoor substation of the new test plant, to show the disposition of the reactors and the power transformers

which can be varied to meet the required conditions of excitation. This rectifier, housed inside the test substation, is fed from the 11 kV works supply through an outdoor transformer.

The a.c. current from the alternator under test is conveyed to the reactors by tubular copper busbars, which have a normal current-carrying capacity of 6,000 amps, and are insulated for 30 kV working. The alternator is solidly connected to the reactors, fault protection being arranged to trip the excitation both of the alternator under test and of the loading reactors, thus making the a.c. circuit dead.



Interior of the test substation to show exciters and motor alternator sets. The test transformers are on the right

Substation

Adjacent to the test beds is the test substation, which houses the power plant and the switchboards for the 11 kV and 440 volt a.c. supplies and the 460 volt d.c. supply. The power plant includes a motor generator set, comprising a 2,000 kW d.c. generator, a 4,000 kVA synchronous machine and a 750 h.p. synchronous inductor motor. Also in the substation are the two induction regulators which control the supply voltage to the driving motor of the alternator under test, the grid-controlled rectifier for the excitation of the saturable reactors and a 400 kW exciter set for the alternator rotor. As can be seen from the illustration ample room has been left in the substation for the addition of further special test plant at a later date.

Control Room

Central with respect to the length of the test bed is a permanent control room for the tester in charge. In this room, all the test and auxiliary instruments are situated. Permanent metering is installed for the driving motor circuit, and ammeters are included in the circuits of all essential auxiliaries, together with the usual alarm warnings to indicate the failure of any important circuit. Metering for the alternator under test is effected by portable substandard instruments while 48- and 12-point temperature indicators give readings from the normal embedded temperature detectors and additional temporary test thermocouples.

Facing the control board is the lubrication panel with its valves, pressure gauges, sight flow indicator and oil thermometers for the supervision of the lubrication system, and for test readings special screened cables are provided to connect the test beds with the oscillographs located in a separate section which is complete with a photographic darkroom. Records are taken on a 6-element electromagnetic oscillograph using a film 120 mm wide by 320 mm long. Alternative arrangements permit the use of a continuous film for measuring transients or where records over longer periods are required.

When we saw the test arrangements last week, the third of the six hydrogen cooled alternators being built for Uskmouth was on the test bed. Normally this machine is rated for 75 MVA when operating with hydrogen at ½ lb/sq in. positive pressure, but for the purpose of demonstrating the capacity of the equipment, the hydrogen pressure had been raised to 15 lb/sq in., which enabled the loading of the machine to be taken up to 100 MVA.

It should be emphasised that these test beds are primarily installed as an adjunct to design, as under the controlled conditions of operation, essential data are quickly made available to the designer and can thus be used to the full in subsequent production without the time delay involved in awaiting performance data from the equipment in operational service. It is believed that this test plant, with its comprehensive facilities, is the only one of its type in service in the world.

Our readers' views . . .

Fluorescent Street Lighting

I WAS particularly interested in the article by Messrs. Weston and Grundy on fluorescent street lighting in your issue dated November 26th, 1953, because I have, myself, advocated for some considerable time a more objective approach to the question of street lighting sources. It has always seemed to me particularly unfortunate that the "luxury" notion should have been allowed to persist, as regards fluorescent street lighting, long after it had ceased to apply. It is a pity that, as a result, so many Lighting Authorities have been content to confine their examination of new lighting schemes to mercury and sodium. It is a pity, also, that the Ministry of Transport, in the exercise of Defence Regulation 56A, has been in the position, probably unwillingly, of having to approve street lighting schemes largely on the totally unsatisfactory basis of their capital cost, and has thereby seemed to endorse this untenable hypothesis.

There is no guarantee that the various types of street lighting will receive objective consideration according to their merits while capital investment is restricted in the present arbitrary manner and one can only hope that two processes will function side by side in the future, namely, that capital investment in street lighting will be freed from restrictions so that Lighting Authorities can plan street lighting on the proper economic basis, i.e. on overall running costs and not capital cost, and secondly, that Lighting Authorities will consider fluorescent street lighting on its merits alongside its competitors. It is not fair, either to ratepayers or to road users, to deny them the best street lighting when it can be obtained as cheaply as the second best.

W. Robinson

HIGHGATE, N.6

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IN reply to your correspondent *"1066"* and his remarks concerning our recent article entitled "Is Fluorescent Street Lighting Expensive?" we would deny any provocative intention in selecting a title. Our only intention was to promote thought and to encourage others to submit actual audited costs in place of theoretical conjecture.

Regarding his curiosity in the causes for "steadily increasing maintenance charges" we do not think our detailed costs showed a "steady" increase. These charges—which included materials, labour, transport, overheads and in November 1952 a repainting programme—merely fluctuated as one would expect with so many variable considerations having effect.

That sodium lighting is better in fog is an assertion by *"1066"* that has no scientific basis. Much has been written in defence of this assumption admittedly, but even if a yellow light is ever proved to be more efficient in fog, it is rather drastic to advocate a type of lighting merely because it suits abnormal weather conditions. In times of fog, most people will agree that there is little one can do about it at present.

Your correspondent also criticises our choice of illustrations to compare the effect of glare of mercury vapour lighting with fluorescent. We would assure him, however, that the effect of high buildings bordering a roadway is negligible in the matter of glare —cumulative or otherwise. The main reason for there being less glare from fluorescent is due to the large area and low brightness of the lamp *source*.

A recent experiment by Mr. Grundy involved the taking of night photographs in a built-up street which was alternately illuminated by mercury vapour refractor lanterns and fluorescent reflector lanterns. Photographs of each system were taken within five minutes of each other under the same conditions and from the same viewpoint. A car parked in the middle distance was used as a focal point, and it is interesting to note that in the case of the mercury vapour installation this car was almost invisible due to glare, whilst in the fluorescent installation it was clearly visible. Similarly the distance of visibility also suffered; in the instance of the mercury vapour installation, the "horizon" was undiscernible.

Unfortunately these photographs were too small to reproduce in faithful detail.

Further investigations are being made into street lighting costs, and we hope to present our findings in the form of a further article in the near future.

H. W. Weston
J. T. Grundy

LONDON, E.C.4

THE ELECTRICITY REGULATIONS —*Their Origin and Effect*

By H. W. SWANN*, O.B.E., D.F.H. (Hons.), M.I.E.E.

I HAVE never seen the official Home Office files which contain the information which led to a decision, soon after the year 1901, to make electrical regulations in the interests of persons employed in factories. There were no doubt reasons for the step, which must have seemed strong to the administrative officers of that time, as otherwise they would hardly have taken the somewhat unusual course of trying to close the stable door before the horses got out. The earliest accident reports of which I know are those of the year 1903 when four electrical fatalities occurred on factory premises and although such figures could not be regarded as numerically impressive, even in those days, they must have led to some apprehension in the minds of officers to whom the wonders of electricity were new and thus were viewed with misgiving. However this may be, the effort seems to have been exhausting and no attempt was made to revise or extend the regulations then drafted until the year 1944, although new powers were acquired in the Factories Act, 1937.

The First Draft

My predecessor, as H.M. Senior Electrical Inspector of Factories, the late Gilbert Scott Ram, O.B.E., M.I.E.E., was one of Robert Hammond's boys, and came from the Coventry Electricity Undertaking, where he had been Borough Electrical Engineer. His first job at the Home Office was to draft some electrical regulations based mainly on his own experience, but also to some extent on that of the late A. P. Trotter who was then Electrical Adviser to the old Board of Trade —the Department concerned with electricity supply legislation and the safety of the public. Ram once told me the story of how it was done. The Chief Inspector of that day, Dr. Whitelegge, suggested that Ram should write out a list of the various things he thought were unsafe in the places he had visited. This list got printed, by mistake, and labelled "Draft Regulations" and although it was really a descriptive catalogue of all the electrical ills of the day, it did actually constitute the first authentic draft.

Ram revised what he called "this appalling document" by classifying the items, and devising a form of words which would cover each group, specify the common danger, and

It was the late Gilbert Scott Ram who drew up the original Electricity Regulations

prohibit it. In this form it was circulated in 1907, and met with considerable opposition, there being 185 objectors. This meant almost everyone in the electrical industry because most of the objectors represented associations, or large organisations and one might have expected the Home Office to be a little daunted at this reception of its well meant efforts. It was, in fact, decided to hear the objections and James Swinburne, M.I.C.E., F.R.S., was appointed a Commissioner for that purpose. He sat at the Caxton Hall and took about ten days over the job.

I have seen his report which contains a pretty full account of what was said, by the objectors, amongst whom were names, even then well known, which have since become famous. With other things it was urged that

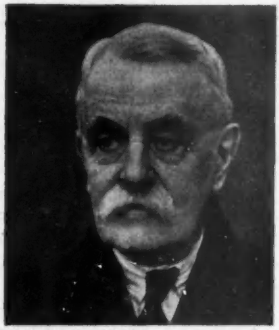
* Latterly H.M. Senior Electrical Inspector of Factories and Electrical Adviser to the Home Office. Now a director of Chilton Electric Products Ltd.

a factory occupier might be the victim of strained interpretations of the regulations by some future Electrical Inspector. Swinburne was evidently impressed and appears to have attached weight to the contention that the regulations as drafted might well prove unduly restrictive if applied to a young industry of which the extent of growth, and the methods of practice, could not be clearly foreseen. He therefore accepted a proposal to form a committee on which the Home Office was represented by a team which included the late Sir John Snell*, the objectors' side being formed by 15 of the 185 led by the late Dr. C. H. Merz. This committee conceived the idea of limiting the requirements to what could be regarded as "reasonably practicable" or "necessary to prevent danger," a course which seems to have satisfied everybody, and they tacked on little provisions here and there to that effect.

This policy, with that of keeping the regulations in general terms, was undoubtedly wise for several reasons. Firstly it prevented anything approaching arbitrary action by an inspector, who must satisfy occupiers, and in the last event, a Court of Law, that the requirements of a particular regulation are reasonably practicable or are necessary to prevent danger. Secondly, the avoidance of detail, and reliance instead on broad principles, has made it possible for industrial supply and utilisation to develop freely, introduce new methods of working and adopting newly invented techniques.

Explanatory Memorandum

Having said this with conviction, it would nevertheless be idle for me to pretend that many people least of all the Factory Inspectors, knew in 1908 what the various clauses in this new code of electrical safety regulations really meant. Swinburne and the objectors, having done their job, all left it to Ram, who had of course sat in at the Inquiry, to tell people. He set to work on an explanatory memorandum which he wrote with such clarity and simplicity of language that it has been regarded as an invaluable text book ever since it was published in 1910. I remember reading it, I fear for the first time, after meeting Ram (also for the first time) when he came to investigate a fatal electrical accident which had occurred at an Undertaking where I was employed. Had I read the memo, the existence of which I had not previously been aware, I might not have endeavoured to help him to follow the circumstances of the accident by climbing up to the place occupied by the victim. When I came down expecting a word of thanks I received the first lecture of a series which was continued in later years when I worked under him. The respect I conceived for him at the time, and at the subsequent proceedings in Court, was enhanced as I came to know him in the Home Office and realised both the magnitude of the job he had tackled single handed and the conspicuous success he achieved.



Sir James Swinburne conducted the Enquiry into the original draft of the Regulations

The impact of the new regulations on industry was certainly not harsh, sudden or costly. Ram was left to look after his child unaided and before he had made much headway, after writing his memorandum, the 1914-18 war did much to nullify his efforts. It was not until 1922 that he was given a staff of four electrical inspectors and when these men got to work they found that in many, perhaps a majority, of places visited no one had thought it necessary to do much about the Regulations beyond "affixing" them on a wall.

One of the most common complaints these first inspectors experienced from factory managements was that they had never been told what to do. It was seldom that a visit of this new kind of inspector was resented, and most people seemed anxious to avail themselves of technical assistance and advice. It is worth remarking that this attitude has been sustained and that although the work of the inspectors in those early years was necessarily directed to inviting attention to past misdeeds, or perhaps more truthfully "mistakes," their advice has always been welcomed and has helped to influence the

* Sir John Snell, Past President, I.E.E., Chairman of Electricity Commission.

practice of the future. This fact does, I think, afford justification for the policy of recruiting men from the electrical industry who are members of the Institution and who have had considerable experience before joining the Department.

Unconstructive Criticism

Judged against the present-day policy of the Factory Department, which seeks to advise and assent in every possible way, it is curious to remember the official attitude which prevailed when I was first appointed. I was pulled up sharply when it became known that I had ventured to follow the discovery of a contravention by suggestions as to putting things right. I was told by high authority that my job was confined to finding and notifying infringements of the law and that I must not accept the responsibility of telling people what to do about it. The actual words, if I remember right, were—"You are to be critical but not constructive", and I think the Administration of the day were in some fear that they might be badly committed by an "electrician", a new fangled breed of which they had an instinctive distrust. Years afterwards, when I was spending an evening at the home of the personage who gave me this instruction, he showed me some metal switches from which he was getting slight shocks and asked me what he had better do. He has passed on now, but it was not the switches.

The electrical inspectors did, however, try to inspire a measure of confidence both inside and outside the Department, and in a few years the Annual Report of the Chief Inspector devoted space to describing the value of advisory work and the efforts made to secure the interest of electrical manufacturers in safe design before sale to the user. This latter policy was, and still is, more likely to achieve results than door to door visits to users of manufactured products, although, of course, the Regulations do not apply to such products until they are used on factory premises.

The manufacturers did not take kindly to these well-meant approaches at the outset: firstly because it was just another burden to shoulder, and secondly, because the proportion of a particular line of fittings, components, or equipment sold to factory occupiers might well be small when compared with the total output to customers not subject to regulations. There was also the question of price because the modifications suggested by an inspector might well lead to increases which placed one manufacturer at a disadvantage with his competitors. These difficulties were real and were not overcome all at once by any means, but the inspectors, who had to learn the best way round, generally found that if they really had a substantial point, and some evidence of accidents, they could secure the interest and often the goodwill of the manufacturer. The personal and individual approach was, in fact, rather more successful than collective meetings with groups, but both are essentially complementary to each other.

Measuring Success

Any talk about "success", however, in connection with the Regulations, always raises in my mind the difficulty of estimating what it has amounted to. The accompanying table gives an indication of the electrical accident rate in factories over the years between 1903 and 1950, and remembering how electric supply and utilisation has increased during that time it is evident that the ratio of accidents to industrial use was higher in the early years than it is now. The electrical industry is certainly entitled to share with the Department any credit deserved for this, but I have

TABLE 1. ELECTRICAL ACCIDENTS REPORTED TO THE FACTORY DEPARTMENT

Year	Non-fatal Accidents	Fatal Accidents
1903 ...	153	4
1913 ...	512	20
1923 ...	340	21
1933 ...	321	25
1943 ...	1,255	58
1950 ...	778	38

sometimes thought that the long arm of coincidence has a larger share in it than anything, or anybody else. On some of the occasions when I have been privileged to address electrical people I have asked if there was any one present who had not had an electric shock, and so far nobody has claimed that eminently desirable distinction. The voltage which gives a trivial shock is often the same as that causing a fatality, and it follows, I think, that survival depends on the coincidence of the well-known factors of conducting floor, area of contact, path of the current through the body, its value character and duration.

When I was a raw student at Faraday House the late Dr. Alexander Russell* once discussed these points with me on a day when I had inadvertently caused a short circuit in the physics laboratory during the

* Dr. Alexander Russell, M.A., D.SC., Past President, I.E.E., Principal of Faraday House.

performance of an unauthorised experiment which took the form of a competition with other students on our relative ability to endure an electric shock. After some introductory remarks Dr. Russell became interested however and proved to have the toughest skin of the lot. I think he was pleased at our admiration and he showed me quite kindly how to renew the fuses without touching the earthed metal case whilst I twisted the end of the fuse wire round the live terminal.

The Regulations to some extent seek to prevent a chain of coincident events by requiring earthing and the use of insulating mats, but such success as they may have attained is the more remarkable when it is realised that they number only 32 paragraphs or clauses, and that of these some are now rarely invoked by an inspector. For instance it is not often that he has to ask for a handle to be provided for a switch (Reg. 3(c)) or for the metal cases of instruments working at high pressure to be earthed (Reg. 18(b)). What is perhaps still more remarkable however is that although inspectors commonly apply the code to equipment, or conditions, which were unknown in 1908 when it was issued, nobody, so far as I know, has asked for it to be revised and brought up to date in the light of modern practice. Sooner or later however this will have to be done and it will be interesting to see whether the initiative comes from inside or out. Any suggestions of changes, will probably follow some marked innovation such as a considerable extension in the application of electronics to factory processes. When the event comes I hope that those who will be concerned will resist requests for detailed and close fitting regulations because electrical progress, with changes of technique, is just as likely over the next 20 years as it has been in the past and the experience which has been gained of the working of a code framed in wide general terms should not be lightly thrown aside.

Some Disadvantages

Having said so much in support of the general character of the existing regulations it is necessary to introduce the inevitable qualification and look at some of the disadvantages. An explanatory memorandum is a most necessary corollary but although this can be revised from time to time without the formality which attends a revision of official regulations, it is nothing more than the personal ideas of a senior officer as to what he thinks should be done to meet the requirements of the latter. No two officers would express quite the same opinion and the main comfort inherent in an explanatory memo is that it gives an indication of what the officer of the day is likely to ask for. If official staff changes were frequent, which has not so far been the case, new recruits might, in the absence of background and experience, give their own personal interpretations of the regulations and furthermore the workpeople do undoubtedly have difficulty in understanding either the limits within which the regulations apply or their requirements.

Memo and Reports

It is the *regulations* which the law requires the occupier to "affix" in a place where they can be read and I have met and talked to many electrical fitters, wiremen and electricians who have never heard of an explanatory memo. There is the widest variation of opinion amongst these people as to what constitutes a risk and probably the best approach we ever made towards giving them information likely to be useful was when we started "Electrical Accidents" in leaflet form in 1930 at price twopence. My original idea, as conveyed in the preface, was that the low price would make it possible for employers to purchase enough copies to hand out to their electrical folk and many of them did, but the Stationery Office put it up to threepence the next year and fourpence in 1932. I thought I ought to give value for money so I then made it a bit longer but they responded by pricing it at sixpence in 1933. After special "representations" it came down to fourpence again but they made up for that by pushing it to ninepence in 1935 and the last issue, for 1951 (published recently) cost three shillings, so that the original intention has perhaps been lost. The present day version is an attractive publication in a blue cover with a streak of white lightning across it to which E.D.A. has not so far taken exception!

Some disadvantage of a general code became evident in legal proceedings and both magistrates and judges may be critical of "indeterminate expression". When Ram wrote his draft with the idea of making each general paragraph cover a wide number of particular dangers, I do not think he had heard this legal term or that of *"in cumulo"*, which means that the offender has to transgress the whole content of a regulation before he can be convicted of contravening it. When

one reads what Ram packed into some of his paragraphs one can see that under this dictum an offender would really have to make a job of it, and, perhaps fortunately, we have not often had to meet this point in Court.

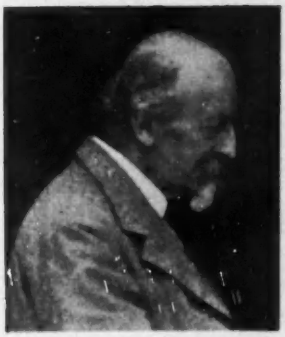
Another legal difficulty arises on the degree of "foreseeability" of the dangers alleged to be inherent in the terms of a general regulation. I have before me an extract from a High Court decision of 1930 which reads: "It is nothing to the purpose to say that this accident was not anticipated", but in a more recent case the learned judge found that no one could have expected or foreseen that the deceased would act in the way which caused his death and gave judgment accordingly. This perhaps shows that regulations which lack precision may be wide enough to admit of two opinions which, although diametrically opposed, must none the less be regarded with that respect which is due to law.

Technical and Administrative

Whilst it is a very good thing that an electrical inspector should have to prove his case and show that something is not only dangerous but that steps to prevent that condition are "reasonably practicable", it must be remembered that he has to deal with two very different classes of people—the technical and the non-technical. If his case is really sound he can get it over to open-minded engineers, who talk his language, before an accident occurs. When, however, he reaches managerial, or administrative level, where decisions as to cost are usually taken, his case may require some evidence of previous accidents in support, and the more numerous they are the easier the job becomes. Should he fail to make progress, and arrange through the proper channel for an invitation to be issued to the occupier to attend at Court, his case will be presented by a non-electrical representative of the Department and heard by laymen. If the inspector's contention is merely that something is dangerous although it has not yet caused an accident, the Court, after hearing conflicting evidence from experts, might very well take the view that the inspector is being fussy and inclined to meet trouble half way. Indeed, the electrical inspector would seldom be able to persuade the Department to go to Court on such a case, but if the regulation stated a precise requirement, the proof of its contravention becomes a matter of fact rather than of opinion or apprehension.

The open character of the Regulations does, in fact, hamper preventive action when it comes to enforcement and thus there is more than a tendency for prosecutions to be limited to cases where there has been a fatality, or a serious accident, which usually constitute adequate proof of danger and, as people often attain wisdom after the event, that there were plenty of "practicable" ways of preventing it.

The effect of a successful prosecution is, however, in itself preventive, and an experienced inspector with an extensive knowledge of accident causation and of past cases in Court, can usually make headway, especially



The late Mr. A. P. Trotter was Electrical Adviser to the Board of Trade. His experience was incorporated in the first Draft Regulations

if he has a personality which secures the goodwill of occupiers in his area. Many of the visits made are, in fact, in response to requests from people who wish for advice often in connection with new projects.

Cases in Court

Prosecutions under the Electricity Regulations are, however, somewhat rare events, a fact which is not entirely due to lack of offences. When a case for presentation in Court is under consideration, weakness may be found either in the relevant regulation or in the Factory Act law on which they are based. There may also be insufficient evidence available to put before a Court, especially if the person most likely to know what happened has unfortunately been killed. There is further difficulty arising from the fact that the non-technical representative of the Department, to whom it would fall to take the case, may not have had much previous experience in handling an electrical prosecution and thus may not be confident of a successful result. In a somewhat elderly Departmental note

prepared for the guidance of inspectors on legal proceedings, they are told that the conduct of a difficult case calls for considerable skill and dexterity in the art of persuasion and is a test of the ability of an inspector to present a clear and logical statement of facts and the law bearing on them, in order that the Court may be convinced beyond reasonable doubt that certain inferences are correct. The use of simple language is advocated in a closely succeeding paragraph, and technicalities are to be eschewed.

Selected Inspectors

I have been present at a number of hearings and have often admired the way in which a non-electrical inspector, or learned counsel, has presented his case and unravelled the evidence of electrical fitters, jointers, wiremen, technicians and inspectors who are apt to speak a language of their own, and are not always at their best under cross examination. It has led me to think however that it might be in the interests of both the Courts and the Department if electrical prosecutions were handled by one or two selected inspectors who would, by reason of the number of cases entrusted to them, acquire experience both in preparation and presentation which would enable them to save time all round.

Conducting a Case

There would of course be many difficulties in arranging this, but the idea is not original and I remember its being suggested by Sir Gerald Bellhouse in 1931 when he was Chief Inspector. There was however the difference that he wanted me to do the handling, and although in common with other inspectors I was authorised by warrant to plead in Court, I was confronted at the time with the prospect of cases against large Corporations and Power Companies who might all be expected to appear by Counsel. After having seen something of the rough stuff that really learned counsel can dish out in Court, I thought the job was one for somebody else, especially as I was anxious to remain friends with the people I prosecuted. In the event most of the more important electrical cases of that time were in fact undertaken by the Director of Public Prosecutions who either appeared through his officers or by Counsel. It is interesting to note however that I got him to brief the same Counsel several times and I know what that saved me in time and trouble. He lost only one case, when had a bad dose of influenza, and that was put right on appeal.

It is perhaps worth saying here that this particular run of cases arose when the supply people started building large high voltage outdoor sub-stations, and appeared to overlook the fact that it would become necessary to clean, repair and extend them without shutting down. The Central Electricity Board steered clear of trouble, except in one case, and I still remember my feelings one afternoon when the late Sir Johnstone Wright walked into my room at the Home Office with some twelve representatives of the consulting firms who were then acting for the C.E.B. He had telephoned saying he wanted to talk over the bearing of the regulations on the layout of their projected 132 kV Grid and I thought he was coming by himself. I had to rob the adjacent rooms for chairs and tackle a subject of which I had no previous experience whatever, but they were all kind to me and we had what I think must have been one of the earliest talks on the possibilities of "spacing" as distinct from physical division of outdoor switchgear.

Change must Come

In these rather discursive notes on the history and character of the Electricity Regulations I have tried to indicate both their merits and drawbacks and to trace their effect on the electrical industry in general. There are many intricate processes where their requirements are far from clear and application has been possible, in the main, because of the goodwill of the specialised engineers and workpeople concerned. Whilst there is this general willingness to try to make the regulations work they will no doubt continue to achieve their object in large measure, but I do not think they can last for ever.

Fifty Years of Tube Making

COMMEMORATING fifty years of the manufacture of steel tubes is a special number of the "S. & L. Review." This excellently produced book does not purport to provide a comprehensive history of the company but is effectively a pictorial record of the highlights in the growth of Stewarts and Lloyds from 1903 to the present day. In parallel with these salient points of development there is a well-illustrated commentary on world events over the period. Of particular interest is the section dealing with World War II in which the important part played by steel tubes in the war effort is graphically illustrated.

Electrical Safety in Industry

FACTORY INSPECTORS SUGGEST POSSIBLE IMPROVEMENTS

IN many ways it is satisfactory that in spite of the steadily increasing use of electrical power in industry, there is no corresponding increase in the number of electrical accidents occurring. Since the end of the war, the total of reportable accidents has remained between 700 and 800. Yet the distressing fact that is obvious from official reports, is that even this number of accidents could have been greatly reduced by just a little more care on the part of those involved.

This is the oustanding lesson to be drawn from the Factory Department publication "Electrical Accidents and their Causes, 1951" which made its somewhat belated appearance recently. The many incidents described within its covers deserve attention as warnings of what may occur again, if care is not exercised.

It is estimated in this report that 44% of the fatal accidents and rather more of all accidents directly electrical involved forgetfulness, negligence, oversight, ignorance, or some similar shortcoming. In one sixth of all cases (eye-flash in electrical welding being excluded) accidents were due to the negligence or oversight of someone besides the persons injured. A further 14% were due to failure to follow instructions given, or else to faulty instructions. Finally, it may be noted that 122 accidents, 22%, occurred when live gear was being worked upon.

Electricity Supply

For some time it has been recognised that much of the switchgear installed on public supply circuits is not up to the job imposed by growing systems and consequently increasing short circuit capacities. For this reason, many switches are being replaced or converted. It is not always realised so clearly, however, that it may be necessary at the same time to replace the rest of the switchboard equipment. As a result there have been failures due to busbars and isolating switches failing to withstand the heavy mechanical forces developed during the flow of fault currents. In some cases, for instance, the isolating switches have been blown into the open position, with dangerous arcing and burning of the switch contacts as a result.

Where work has to be undertaken on h.v. gear, there is usually some form of permit-to-work procedure in operation. In spite of this, however, accidents continue to occur. It has been found that many of these accidents happen because of mistakes made in the earthing procedure prior to the work itself being undertaken. It is suggested in the report that this fact cannot be dissociated from the failure of most permit-to-work cards to make any provision for detailing the procedure to be followed in isolating the apparatus and affixing the earth connections. This is the most dangerous part of the work, and although it is usually in the hands of an engineer of some seniority, it should be carried out to carefully considered written instructions.

There are three main types of accident that occur in this connection. Mistakes are made in isolating the apparatus; there is failure to test that the apparatus is dead; and finally, earth connections are affixed to live apparatus.

Two further causes of accidents may be noted for their practical importance. The first concerns the use of varnished cambric tape as an "insulant" for high voltage conductors. There were four cases where workers were severely burned through touching cables insulated in this manner. The other danger

TABLE 1. REPORTABLE ACCIDENTS IN RELATION TO EMPLOYMENT, 1951

Occupation	Fatal	Non-Fatal	Total
Skilled.			
Supervisory Staff	3	25	28
Swbd. and Substn. Attendts.	—	7	7
Testing Staff	—	15	15
Electricians, Jointers, etc. ...	4	191	195
Fitters, Erectors, etc. ...	3	41	44
Unskilled.			
Crane Drivers	—	11	11
Other trades and grades:			
(a) Men over 21	21	169	190
(b) Men under 21 ...	3	45	48
(c) Women over 21 ...	—	16	16
(d) Women under 21 ...	—	9	9
All cases of eye-flash from electric welding	—	152	152
TOTAL	34	681	715

Electrical Accidents and their Causes is published as Factory Form 929, price 3s. by H.M.S.O.

concerns the use of a test indicator to check that a circuit was dead. One particular instrument used was not protected by h.r.c. fuses, and when it developed an internal fault the man using it was fatally burnt by the resultant heavy short-circuit current.

Industrial Applications

In industry generally there has been increasing attention to systematic electrical maintenance in the last few years, an improvement that is strongly welcomed by the Factory Department.

One of the main investigations carried out by the Department during 1951 concerned earth circuit resistance. Measurements were made in a large number of factories using a loop resistance tester. Table 2 lists the results obtained. It was found that earth electrodes consisting of metallic water mains or of earth rods installed in a proper manner are usually efficient for most purposes, although the loop resistance may in some cases exceed the value necessary to ensure clearance of earth faults by the most heavily rated fuses or protective gear on the premises. Earthing to cable sheaths, where permitted by the supply authority is perhaps the most effective method.

TABLE 2. TESTS ON EARTH ELECTRODES IN FACTORIES

Type of Electrode	Number Tested	15 amp Clearance* %	Largest Clearance† %
Water Mains ...	45	100	87
Spikes	26	15·5	11·5
Cable sheaths ...	7	100	100
Mats or plates ...	9	78	22
Building steelwork	4	75	25
Miscellaneous ...	4	75	50
Unknown	14	100	93

* Effective for clearance of earth faults on circuits fused up to 15 amps. † Effective for clearance of earth faults on circuits protected by largest fuses on premises.

Earth spikes of various types gave very uncertain results. One length of 2½ in. conduit, driven 6 ft into the ground, had an effective earth resistance of over 40 ohms. A 3 ft 6 in. length of 2 in. by ¼ in. copper strip, driven into made-up shingle on a building site gave the highest resistance of all, 490 ohms.

Cranes

Contact with crane trolley wires continues to be responsible for a large number of accidents. The present trend in design is to enclose trolley wires completely or else to dispense with them altogether. In the latter case, there are four principle systems that may be used. The first of these is spring-loaded drums, together with suitable t.r.s. cables. Others are, pre-kinked festooned t.r.s. cable, suspended in pig tails from bobbins threaded on a simple catenary wire; a cable drum on the crane gantry, having two cables, one going to each end of the run, so giving a rewinding feature; and finally, a number of contact skids, lengths of 2 in. channel iron, mounted on the crane carriage, making contact with fixed pick-up points along the side of the track. This last method has proved particularly useful in the difficult conditions of a foundry melting shop.

Several accidents with cranes and lifting blocks stress again the importance of regular and frequent examination and test of limit switches and similar safety fixtures.

Electronics

Of necessity, the foregoing notes are only a very partial summary of that part of the report which deals with power frequency apparatus. Room must, however, be found for some notes on the Department's remarks on the increasingly common electronic apparatus which is making its way into industrial workshops. Five essential principles are suggested for ensuring reliability in industrial electronic apparatus, and these may be usefully enumerated.

(1) Sound original design, incorporating failure to safety in all respects practical. (2) Good construction based on experience gained with industrial control gear, with testing at all stages of manufacture. (3) Appropriate siting of equipment in factory, having regard to such conditions as cleanliness, vibration, temperature and humidity. This may be particularly important with regard to air cooling. (4) Proper maintenance, which in its turn is greatly facilitated by unit or shelf construction of the apparatus concerned. Another design feature which can assist maintenance is the provision of test jacks at appropriate points in circuits so that instrument readings may be obtained without opening up enclosures.

These are only leading principles, of course. It is recognised that another difficulty is to obtain suitable maintenance men to take care of electronic equipment. Various special training schemes are being organised by individual firms, and their results will be watched with interest. What does seem to be generally agreed is that it is not possible to employ a ready-made electronic maintenance engineer who is fully satisfactory for the type of work found in factories.

Outdoor Generation

Ince shows Advantages additional to Financial Savings

IF generating plant can operate in the open-air, then it seems obvious that some saving in capital cost per kilowatt of power stations must be possible. That, at its simplest, is the basis of the arguments in favour of outdoor and semi-outdoor power stations, and hence of the station which the B.E.A. is building at Ince, on the Wirral Peninsula of Cheshire. How the idea works out under British conditions is described in a paper "Some Design Features of the Semi-Outdoor Power Station at Ince," which MR. F. H. S. BROWN, B.SC., M.I.E.E., M.I.MECH.E., (B.E.A.), presented at an I.E.E. Supply Section meeting last week.

Ince is to be a 240 MW station, with four 60 MW turbo-alternators and slung unit boilers for the standard steam conditions of 900 lb/sq in., 900° F. It is being regarded partly as a full-scale experiment on the suitability of the semi-outdoor station for use in Britain. At the stage now reached, i.e. with design completed, the majority of contracts placed, and site construction fairly well advanced, sufficient is known to indicate that this type of station can reduce capital costs, and that site work is expedited to some extent. The second part of the experiment, the determination of the effect on operation and maintenance, remains to be carried out. On it will depend whether on balance the semi-outdoor station is a more attractive proposition than the orthodox station.

General Considerations

The superstructure of an orthodox power station consists basically of a strong framework which has as its primary duty the supporting of generating plant, cranes and auxiliaries, and to which is applied some weatherproof cladding on walls and roof. The cost of such weatherproofing does not form so large a part of the overall superstructure costs as might be expected from a casual inspection.

With operational needs in mind, the fundamental decision upon which the design of Ince is based is, that all main operating positions and all parts of plant requiring routine access for either operation or maintenance should be adequately protected from cold or wet weather, and should be so arranged as to provide acceptable conditions for the personnel involved.

On this basis, a normal type of turbine house has been provided. In the boiler house, however, a considerable amount of the normal enclosure has been omitted. Amongst the resulting advantages are the avoidance of the convection currents which normally lead to high ambient temperatures at the top of a conventional boiler house, and the possibility of isolating each boiler from its neighbour, so far as enclosed parts are concerned. This last feature makes it possible for the maintenance of a standing boiler to proceed in a cool clean atmosphere. The whole problem of ventilation is far more tractable than in a conventional boiler house.

Ince Construction

The points requiring most frequent routine operating attention on a p.f. boiler, apart from the main control panel, are coal chutes and feeders, pulverising mills, the combustion chamber, ash hoppers, and such items as gauge glasses and feed-water regulators. These points are totally enclosed under the terms of reference for Ince; and no other parts are enclosed if any saving in costs results from leaving them exposed, always assuming that no technical considerations intervene.

In the result, the bunker and mill bay are enclosed in an orthodox building, while the ash hoppers are enclosed in a semi-basement 14 ft below ground-level, over which a suspended floor is constructed at ground level.

Between the end of the bunker bay and the first line of boiler stanchions there is an 8 ft 9 in. gap, introduced partly for reasons of structural steelwork. This gap is covered for its full height and length and it permits access to any part of the station from the boiler side of the bunker bay. It also provides a fully enclosed route for pipework runs.

Combustion chamber and burners of each boiler are enclosed by light sheeting on the back and each side between ground level and the top of the chamber. The fourth side opens

on to the access way mentioned above. The boiler uptake is then exposed, but the drum level is again individually enclosed over its whole area on the front and each side, with a roof overall. The primary superheater, economiser, air heaters, grit arresters, fans and associated ductwork are completely exposed.

Naturally, much of the detailed working out of economies in a semi-outdoor design depends on such civil engineering matters as distances between stanchion centres. These are discussed at some length in the paper, but they will not be dwelt upon here. The main effect is to give greater flexibility in the arrangement of the boiler house steelwork.

Savings in Cost

It is very difficult to give any accurate assessment of the savings in cost resulting from this reduction in building work. It would be possible to design and cost an "identical" conventional station for the same site, but this would be a very expensive procedure. However, an approximate assessment of the probable savings was made in the very early stages of the design, and this led to the conclusion that a total economy of at least £100,000 should be possible on the completed 240 MW station, compared with an orthodox design. At about 8s. 6d./kW this seems rather small, for £2/kW has been mentioned by some engineers.

Now that the station has been designed in detail, better comparisons are possible. Table 1 has been drawn up on the basis of comparison with the cheapest station contemporary with Ince and using 60 MW units. In this respect, it must be remembered that such items as the cost of foundations and cooling systems, over which the designer has relatively little control once the site is fixed, may greatly influence the total station cost.

In Mr. Brown's opinion, the gross reduction in capital cost which can result from a semi-outdoor design may well exceed £1 per kilowatt installed.

Reduced Efficiency

Against this saving in cost must be set some reduction in thermal efficiency, owing to the loss of heat radiated by boiler casings and other hot surfaces, which in an orthodox station is to some extent reclaimed in terms of a higher inlet temperature at the induced draught fans. Corrosion appears to introduce few new problems, so far as external attack is concerned. There have been suggestions that internal corrosion may result from the condensation of combustion gases on cool surfaces, It appears, however, that no special precautions against this have been taken in American outdoor stations, and that no trouble has resulted.

Frost protection does introduce some difficulty, especially in regard to drains. The majority of drains originate at or about drum level and difficulties are avoided by routing them across the enclosed space between the front of the boilers and the bunker. This provided a subsidiary reason for enclosing this gap. Certain other leads, originating elsewhere, are specially dealt with.

This impression of Ince when completed shows that no apologies for appearance will be needed

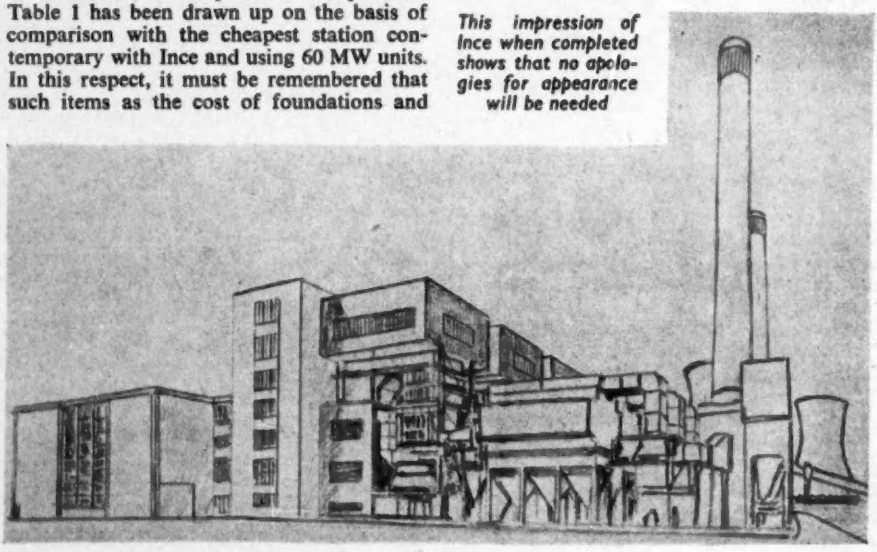


TABLE 1. COMPARISON BETWEEN INCE AND A CONTEMPORARY ORTHODOX STATION.

	Orthodox Station	Ince Station
Capacity, MW	240	240
Number of units	4	4
Enclosed volume, cu ft/kW		
Turbine room	15·7	15·5
Boiler house (including bunker bay)	13·0	8·9
Total	28·7	24·4
Structural steel usage, tons/MW *		
Turbine House	—*	9·21
Boiler House	11·3	8·81
Total	—*	18·02
Civil Costs, £/kW		
Foundations, including site clearance, etc.	3·188	4·211
Structural Framework ...	2·588	2·031
Superstructure	3·500	2·260

* Main buildings only. The framing of the turbine room of the orthodox station is in reinforced concrete.

DISCUSSION

SIR HUGH BEAVER, chairman of the recent committee on power station construction, said that the paper marked a real advance, worthy of note. He himself was more interested in the economic side of the question than the technical, and it was necessary in this respect to note that the semi-outdoor construction was only one of many advances in recent years which had reduced the cost of power station construction. Nevertheless, the reduction from 50 cu ft/kW installed to 24 cu ft at Ince and to 17·5 cu ft in another station was a very considerable achievement. He thought that £1 as the saving per kilowatt represented a very conservative estimate, but even this was enormous spread over the whole power station building programme.

Besides savings in money, savings in other commodities such as steel, bricks and labour were important, as was any speeding up of building. Given wise guidance, courage and the financial power behind the B.E.A., there was no reason why this country should fall behind America in these things.

P. PERCIVAL (Merz & McLellan) had been investigating the subject from the point of view of overseas power stations. In this country the only advantage of outdoor construction was cheapness, but it might become increasingly important when 200 MW units were considered, with unit boilers 250 ft high. Basing his calculations on a unit boiler-turbine station having 30 MW sets and a brick-clad turbine house, he had estimated a saving of 15% in structural steelwork for the boiler and turbine house. The overall saving from adopting semi-outdoor construction would be 9s./kW, which checked with the Author's original estimate for Ince. He estimated the ultimate saving at Ince at about 13s./kW.

E. BATESON (Rendell, Palmer & Tritton), speaking as a partner in the civil consulting firm concerned with Ince, discussed various topics including the advisibility, in his view, of metal spraying the exposed structural steelwork to prevent corrosion.

J. MAYER (International Combustion) thought it an error to have built at Ince with a mixture of horizontal and vertical partitioning. One trouble was that boilers similar to those used in some other stations were installed. He now felt that it would have been better to have considered the ideal enclosure, and then have modified the boiler to fit in with this.

So far as the calculation of extra heat losses were concerned, he felt that the performance of the air heaters was the crux of the matter. On the whole, he considered that a clear saving in capital expenditure of 30s./kW was necessary to justify an outdoors station.

F. J. HUTCHINSON (Kennedy & Donkin) criticised the arrangement of the railway sidings at Ince. Turning to the subject of gas exit temperatures, he doubted if it would be possible to lower these with the high chlorine content coal likely to be burnt. He thought that the i.d. air intake would cause a great draught. However, he was confident that the method of construction advocated by the author would cut ten months or so off the time required to erect a station.

SIR JOHN HACKING (B.E.A.) spoke of the excessive attention sometimes paid to U.S. practice, and emphasised the difficulty of really getting a description of representative experience in that country. It had even been stated that an outside boiler house was standard practice in the U.S.A., but this was far from being so. One American engineer when pressed on the point admitted that savings resulting from outdoor construction were only of the second order of magnitude, but supported the technique because of the much better conditions it offered to operators.

Speaking of the time taken for power station construction, he said that one of the most difficult problems was to imbue those involved in the planning stage with a sense of urgency. This sense was damped by the long process of acquiring permissions.

K. H. TUSON (Mackness & Shipley) considered the figure of saving disappointing after what the Beaver report had suggested. He was surprised that the opportunity had not been taken of having a lighter gantry crane spanning the turbine room.

H. D. WATSON (Mitchell Engineering) thought that the type of cladding used at Ince should be more widely employed. He quoted examples of outside boiler houses in British oil installations, stressing the advantages of limited covering for some sections of the installation.

Several other speakers contributed to the discussion, and the author replied briefly.

From AN ENGINEER'S NOTEBOOK

ELECTRICAL contacts are coming under the microscope. We seem to have awakened at last to the extent of our ignorance on the basic theory of those many varied devices which we take for granted. Electrical contacts theory was even made the basis of a recent I.E.E. symposium, which unfortunately did not reach the wider public of a London meeting. In other parts of the world, also, fundamental work is being done on contacts, and who knows what benefits we engineers may ultimately derive from this intensive approach. From South Africa, for instance, there comes the surprising discovery that contacts held together by magnetic force have a lower contact resistance than when held together by an equal mechanical pressure. The difference is particularly marked at low pressures, and as the force increases, the two resistance values approach one another. Thus any hope of even smaller contactors than at present is foregone, but the phenomenon is more likely to find application in light current engineering. The theory advanced to account for this lower resistance suggests that with magnetic pressure more spots are brought into intimate contact than with mechanical pressure, and thus gives the lower resistance found. This is a fairly simple explanation, but one which I hardly find satisfying; particularly as no experimental evidence is available for its support. None the less, it is the discovery we welcome; it is a common experience in science that theories follow after.

* * *

TURNING to a more mundane subject, I was interested in a method of compacting sand for foundations such as in earth dams, levees and the like. It contains no novel principle but relies rather on brute force to effect the compacting of the sand. The first step is to drive a metal tube into the sand, which is easily achieved by the use of a water jet which causes flotation of the sand in the immediate vicinity of the end of the tube. When a sufficient depth has been reached, an electrically driven eccentric device is energised and the resulting vibration of the tube compacts the surrounding subsoil. All the time the device is running fresh sand is poured in at the top, to fill the void resulting from the compaction. Finally, the tube is withdrawn, the process of compacting being carried on the while. It is said that the use of this device will provide a compact core of sand some 8 ft in diameter and whole areas can be covered by overlapping columns. How much compacted sand stands up to weathering has not been reported, so we still haven't found a cheaper way of building power stations on soft ground.

* * *

IN this atomic age, it is to be accepted as natural for use to be made of such relatively simple ideas as control of molecular structure. None the less, a heat pump based on such principles and used for obtaining temperatures below 1° absolute, certainly appeals to me for its simplicity and novelty. The basic idea makes use of the temperature increase of a paramagnetic salt when subjected to a magnetic field due to a change in molecular structure. The flow of heat through the pump is also controlled magnetically by the physical effect exhibited by lead at those low temperatures, of becoming relatively a non-conductor of heat when likewise subjected to a magnetic field. This, then, is the mechanism of the heat pump. The paramagnetic salt is heated by the application of a field and the heat so formed is conducted away through a magnetically controlled lead strip, to a bath of liquid helium. This lead valve is then closed to the passage of heat by the application of a magnetic field, and at the same time the field applied to the paramagnetic salt is removed. This has the effect of depressing its temperature to a very low value and by opening a heat path to the body to be cooled through a second lead valve, heat will flow from the body to the salt. By repeating the cycle, therefore, small quantities of heat can be made to flow from the body up a temperature gradient to the liquid helium and in this way temperatures of the order of 0·3° K are said to be obtained. This is one more example of the mysterious physical world which exists near to absolute temperature and of how the special characteristics of materials at these levels have been exploited to further research work in this very field.—*E.R.G.*

THE FESTIVAL HALL HEAT PUMP

Experience Gained During Periods of Operation

IT may be remembered that toward the end of 1948 the Chief Scientist's Division of the Ministry of Fuel and Power decided to undertake as one of its first tasks the development of a large heat pump with a view to obtaining some genuine full scale economic data. About this time it was learned that the Royal Festival Hall was to be heated by a hot-water system based on gas-fired boilers, the choice of fuel having been partly determined by the inconvenience of solid fuel and ash heating. As it was thought that the selection of a more expensive fuel would make the heat-pump an economic proposition, arrangements were accordingly made to provide a heat-pump installation running in parallel with the conventional gas-fired heating system to enable comparison to be made. Some details of the subsequent operation of the overall system were given in a paper presented to the Institute of Fuel by Messrs. P. E. Montagnon and A. L. Ruckley.

Preliminary investigations were hampered by the fact that there was a complete absence of information on the likely number of hours per year when the hall would be occupied. The only information was, in fact, the estimated peak-loading heating requirement for each of the various parts of the hall totalling some 26 m B.Th.U./hr—including an allowance of some 9 m B.Th.U./hr. for the part of the hall to be built later. To meet this load, a set of boilers with a total capacity of 30 m B.Th.U./hr was planned for the conventional heating system of the hall: and somewhat arbitrarily it was decided that an output of 8 to 9 m B.Th.U./hr would be an appropriate level around which to design a heat pump. In the event this choice proved to be quite inappropriate, because the peak load on the hall had been seriously overestimated. The output of 9 m B.Th.U./hr proved to be vastly in excess of both average and peak requirements of the hall.

Cycle Arrangement

Initial calculations showed that the engine power would need to be in the region of 700 h.p. and the mass flow of a suitable refrigerant would have to be about 25 lb/sec. It was apparent that standard speed gas engines and the normal reciprocating refrigerant compressors would be most unwieldy items to meet these requirements, and the risk was therefore taken of using high-speed reciprocating engines driving centrifugal compressors. The source of low grade heat was cold water from the Thames, which gave up heat in the evaporator to boil the liquid refrigerant in the shells at low temperature and pressure (about 32° F and 30 lb/sq in. gauge). After boiling in the evaporator the refrigerant passed through the first stage compressor leaving it at medium temperature and pressure typically about 110° F and 100 lb/sq in. From this point it passed directly to the second stage compressor which brought it up to a suitable pressure and temperature for the hot water system—250 lb/sq in. and 200° F. It was then condensed in the shell of a second heat exchanger, which was cooled by the lower temperature return water from the concert hall, and the pressure and temperature figures then became 250 lb/sq in. 130° F respectively and was then throttled in two stages prior to its return to the evaporator. Modifications were also introduced to utilise waste heat.

Power Plant

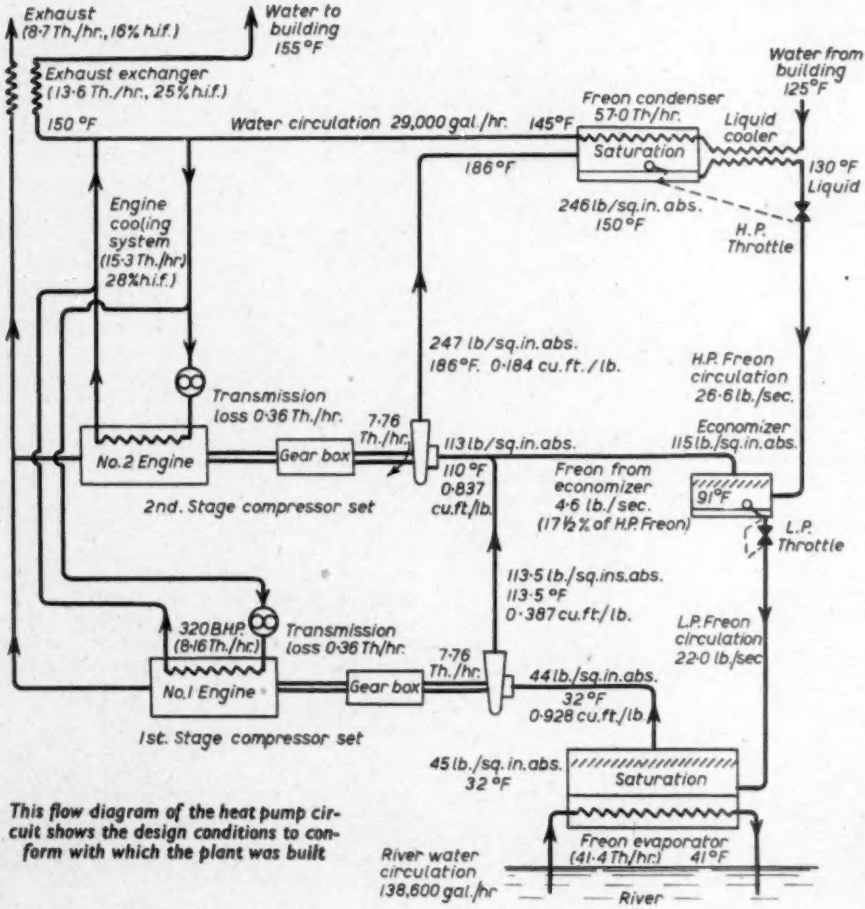
The prime movers comprised two surplus Merlin aircraft engines, with their centrifugal superchargers modified to act as refrigerant compressors. Before serious development work could begin on the engines and compressors, a choice had to be made of standard conditions round which to design the components, and these were selected as shown in the diagram. The entry conditions to the second stage compressor were in some doubt as they depended entirely on the efficiency of the first stage. One serious difficulty was to find a chart showing the physical characteristics of Freon 12 at sufficiently high temperatures. Normally recordings are taken only up to 140° F for refrigerator design.

Operational Results

The chief difficulty in using the plant was one which was never overcome, namely, that events proved that the maximum load required by the concert hall was greatly below the estimate which had been provided at the start. Eight to nine million B.Th.U./hr. output from the heat pump overwhelmed the

requirement by several million B.Th.U./hr with the effect that a steady load for the plant was never achieved and all readings had to be taken with a rising temperature régime. More important, long runs of the plant could not be managed, and the situation was aggravated by the inherent characteristics of the compressors used under such conditions.

The overall cost of the plant was roughly £103,200, considerably in excess of that which would be required for a duplicate installation, which in the authors' views would be about £52,500 complete. Running costs showed an overall efficiency of about 1·25 might be achieved consistently. (This figure should not be confused with the more usual co-efficient of performance, which is based on heat output as compared with power input [not fuel input]. The coefficient of performance could lie between 2·5 and 3·0.) On this basis the cost per therm provided worked out at 10·6d. allowing for fuel burnt and electricity consumed in pumping. Annual charges were not given in the paper, but for a £52,500 installation they were about £6,400. The gas boiler installation could not be compared fairly because of its excessive size, but for a unit of about the same size as the heat pump annual charges would be about £750 and the fuel cost about 17·4d./therm on full load. To show a financial saving, therefore, a load factor of at least 25% must be achieved, but against that is the fact that the heat pump can also be used for cooling, thus saving the cost of a refrigerator. The heat pump, as installed, was a little oversize (when using one compressor) for cooling the Hall during the summer periods when it was used.



This flow diagram of the heat pump circuit shows the design conditions to conform with which the plant was built

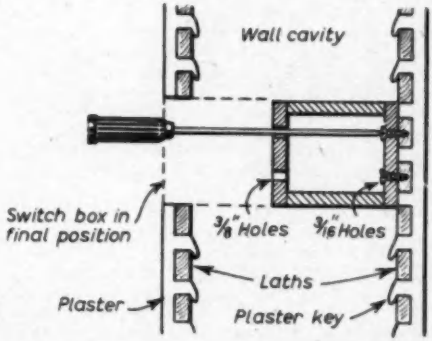
PROBLEMS AND PRACTICE in Engineering

Fixing Flush Switch Boxes

FIXING flush wooden switch boxes into lath and plaster walls often presents difficulty unless the switch position is on a stud, which can then be cut back and fixed to.

Often the nearest stud is at the side of the door lining, and does not project enough to be of any use. The usual method of fixing the box in these circumstances is to screw through the side of the box into the side of the stud. However, this is not altogether satisfactory as the box tends to spring back when fixing the switch screws.

The method I normally use is to make a frame from 2 in. by ½ in. batten consisting of four pieces nailed together. Two $\frac{1}{16}$ in. fixing holes are provided in the back piece and two ¼ in. holes in the front piece to allow the insertion of a screwdriver for screwing the frame to the laths. It is necessary, of course, to break off the plaster key and to use screws that do not exceed the combined width of the batten and lath.



The method used to install flush switch cones, showing, in this diagram, the fitting of the wooden frame to the far wall

This provides quite a rigid fixing for the switch box. Providing a neat hole the size of the switch box has been cut in the lath and plaster and fairly generous overlapping plates are used, no making good to the plaster is necessary. This is particularly useful when the room is not being decorated. To get the cable from the ceiling joist to the switch box is merely a matter of dropping the cable down the wall cavity, and if a timber plate is fixed at the top of the cavity, it is usual to auger a hole through this.

To overcome Reg. 404F, if the drop in the cavity exceeds 3 ft a length of conduit can be used between the switch box and the top of the cavity when using c.t.s. cable. It is necessary, of course, to fix the conduit at the top of the cavity and to drill a hole in the top of the switch box which is a tight fit for the conduit and rubber bush.—*W. Satchwill.*

Guarding Against Gate-Crashing

AFTER experiencing considerable trouble with unauthorised entry into an area in which h.v testing was taking place, I was finally led to improvise a scheme to warn the operator when one of the four doors intc the area was opened. Each door had been fitted with a red warning lamp, but these were not only insufficiently obvious but did not, naturally, provide foolproof indication of door opening.

Micro-break switches had been fitted to each door, operated by a spring on the door itself. These opened the circuit to the lamp, each lamp being wired in parallel on a 230 V a.c. supply. It was a simple matter to fit a telephone type relay in series with the supply to the lamps. Adjusting the operating coil, by shunting it with a suitable resistance, ensured that the relay arm was released when any one of the lamp circuits was opened. This in turn closed the circuit of an alarm bell fitted near the operator's position. Warning is thus given when a door has been opened, and also if one of the lamps fail.

It was also necessary to energise the circuit by means of a d.p. switch, the other contact being connected in series with the control circuit of the solenoid operated o.c.b. supplying the test area. A further lamp across the supply provided indication of supply failure. The system could, of course, be extended by utilising a second pair of contacts on the relay to energise the tripping circuit of the oil breaker. We have been using the scheme for about a year now, and it has proved most successful.—*F. D. Train.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

overseas news

N.B. Extension Approved

The provincial Government has now authorised extensions to the Chatham power plant of the New Brunswick Electric Power Commission. Estimated cost of the expansion has been put at between $2½ million and $3 million. A new steam generator is to be installed which will need about 50,000 tons of soft coal annually, thereby helping the Minto coal area companies, where production has been dropping recently. In addition a transmission line, connecting Chatham with Dalhousie, is to be erected.

Progress of Niagara

At the Sir Adam Beck No. 2 power plant of the Hydro Electric Power Commission of Ontario, lining of the first tunnel, involving about 490,000 cu. yards of concrete, has just been completed. Excavation of rock in the second of the twin five-mile tunnels is about 94% complete.

Merits of Bulk Purchase

The recent contract for the purchase by the Shawinigan Water and Power Co., of a bulk supply from the Bersimis River hydro-electric project of the Quebec Hyro Electric Commission, had obviated the prospective need of the company to spend between $80 million and $100 million on the equivalent expansion of its power plants, Mr. J. A. Fuller, president of the company, has stated. He emphasised that power and other public utilities had been confronted in recent years with a serious problem in the inflationary rise in construction and operating costs, and the consequent drop in the returns on investment because of the lag in the compensating rise in rates charged for services. The need to meet rising demands for power without unduly great expenditure for new plants had been solved in part, he said, by the interchange of purchased power between the developments of Shawinigan, Saguenay Power, and Quebec Hydro at Beauharnois and prospectively at Bersimis. The Shawinigan purchase of Bersimis power, to which we have already referred, will absorb a third of that project's initial capacity output of 1,200,000 h.p. and nearly a quarter of its planned ultimate capacity of 1,700,000.

Another Big Dollar Order

A contract for two 108,000 h.p. waterwheel generators for the McNary dam project, on the Columbia River, U.S.A., has been awarded to the English Electric Export and Trading Co. Ltd. by the U.S. Army Corps of Engineers. Their tender price of $3,651,476 was about 21% below the $4,292,000 offer of the General Electric, the lowest American tender. The maximum output of each generator will be 84,740 kVA at 13.8 kV, 60 cycles, 85.7 r.p.m. With an overall size of nearly 52 ft, these machines will physically rank among the largest ever built, the firm claims. Each complete stator will weigh about 180 tons and have an outside diameter of approximately 42 ft. The assembled rotors will be nearly 35 ft in diameter and over 5 ft deep. The McNary dam hydro-electric project is designed to take fourteen generating sets with a total maximum output of 1,186,400 kVA. The two machines under this present contract, will complete the station, and are due for commissioning before December 1956. Earlier this year Ferranti Ltd. were awarded a contract for the supply of six power tranformers for the project.

Schemes for Colombia

Officials of the Colombia Ministry of Development, are now studying proposals for various electric power schemes, and discussions are taking place with foreign officials who have been invited by the Government. One scheme is for the construction of a hydro electric station at Lake Tota, to produce initially, 10,000 kW, primarily to supply Sogamoso. Preliminary studies have also beeen initiated for a projected hydro-electric station in the Valley of Tensa which could provide Boyaca with about 150 MW, it is estimated. Another scheme, for a thermal station of 14,000 kW, at Zipaquira, is under consideration by La Compania Industrial Electrica "Ergon." From reports it seems that European manufacturers of heavy electrical plant are becoming interested in the prospects of supplying suitable equipment.

O.H. Line to Sicily

Work is steadily progressing on the scheme for erecting an overhead transmission line across the Messina Straits to supply electricity to Sicily from the mainland. The foundations of the two 728 ft high steel towers on either side of the Straits have now been laid, and the steel parts of the towers are being assembled. The span, 11,722 ft, will be the longest in the world for an o.h. line, it is claimed. Minimum height of the line above sea level will be 220 ft. It is hoped to have the lines in operation by next summer.

Uganda Tariffs Up

Defending the recent action of the Uganda Electricity Board in imposing a 25% surcharge on its electricity tariffs, Mr. C. R. Westlake, chairman of the Board, has told members of the

Uganda Chamber of Commerce that the cost of electricity in the protectorate was only 45 to 50% above the 1938 figures. Nowhere in the world was power being sold at such a low increase over 1938 prices, he added. The recent rise had become necessary following higher costs of goods, wages, etc. Referring to the expectation that the Board would save about £330,000 in fuel oil when the Owen Falls project started operating, he warned that consumers should not expect reductions in tariffs, for the Board would also have to start paying capital charges which would more than offset the saving in fuel oil. But the outlook had improved recently, for negotiations for additional loads to be supplied by the Owen Falls station had reached an advanced stage. Subject to these loads maturing it was possible that the tariffs would not go higher, he added.

Decision on Trombay

The Government of Bombay has adhered to its earlier decision to grant permission for the installation of only one 50 MW steam generating set in the first instance at the proposed Trombay power station. The question of a second unit is to be left for later consideration. Officials of the Tata Power Co. have thus failed in their efforts to convince the State Government that it was necessary to install the second set immediately after the first. It is the Bombay Government's belief that the Koyna hydro electric project will be operating by 1957, and that one set at Trombay should meet the increasing demand. Officials of the Tata Co. are convinced that this decision will result in a continuance about 1960-61 of the power shortage from which Bombay and surrounding area has suffered for so many years. The company has now had to compile fresh data to be submitted to the World Bank for a loan covering the installation of one set, in substitution of its earlier particulars providing for two units.

Loan for Ceylon

Ceylon expected to get a loan of Rs. 100 million from the International Bank for Reconstruction for its new hydro-electric project, according to Sir Oliver Goonteilleke, Ceylon's Finance Minister. The loan is to be used entirely for financing the second stage of the Norton Bridge scheme which it is estimated will cost Rs. 140 million. It is hoped to raise the balance in London.

Fan Production

India's electric fan industry could well afford to export its surplus quantity to the neighbouring countries after meeting the country's demand, declared Mr. P. H. Bolland, presiding over the sixth annual general meeting of the Fan Maker's Association of India in Calcutta recently. The total number of fans produced in India during 1952 was 195,600 against the 1951 record year of 212,400. Of the former total 50.75% were produced in factories of members of the Association.

Victoria's Record

Operating results for the year 1952-53 of the State Electricity Commission of Victoria, were the most successful in the Commission's history, according to the report just presented to the Legislative Assembly. Electricity sales were 8% up on the previous year; 26,000 new consumers were connected, and new generating plant installed was a record. After providing for interest, depreciation and other charges, there was a revenue surplus of £343,000. All sections of the Commission earned a profit except the tramway systems in Geelong, Ballarat and Bendigo which again showed a heavy loss on the year's operations.

Whakamaru Progress

The four-year task of preparing the site on the Waikato River for the 100 MW power station at Whakamaru, New Zealand, is nearing its end. By early next year the dam will start to rise from the river bed. Owing to the rather treacherous formations, engineers have experienced difficulty in the grouting operations. A new concrete batching plant, with a capacity of 80 cubic yards an hour, and two radia cableways to deliver the mix to any point on the dam site, will be ready when the grouting is completed. Meanwhile work continues on the earth wings for the dam. Whakamaru will be the first hydro-electric dam in the North Island to be built partly of earth to economise in the use of concrete.

Loan Funds

The North Auckland Electric Power Board, New Zealand, has now received formal approval of its £100,000 loan extension. The Board has received from the National Power Utilisation and Finance Committee a request for detailed information covering the Board's power and loan capital requirements over a period of five years. Mr. Day, secretary of the Board, has said that upon the committee's report might depend largely the rate of construction of generating plants by the State Hydro-Electric Department in the near future.

Heavy Water Plan Shelved

The proposal to produce heavy water from New Zealand's field of geothermal steam in the Wairakei area has been shelved for the time being, Mr. Holland, the Prime Minister has revealed. He said the U.K. Government, with whom the N.Z. Government had planned to develop that project, had advised that it did not wish to participate. Therefore, the New Zealand Government would take no further action in the matter. Instead, the N.Z. Government is to concentrate all efforts now on the development of electric power from the geothermal steam, and is awaiting a further report on the matter from the consulting engineers, Merz and McLellan, as we reported last week.

PERSONALITIES IN THE INDUSTRY

Formerly sales manager with Erg Industrial Corporation, Ltd., **Mr. V. G. P. Weake** has joined the associated firms of W. Bryan Savage, Ltd., and Pamphonic Reproducers, Ltd., as their general sales manager.

Mr. V. G. P. Weake

Changes in the directorate of Thos. W. Ward, Ltd., are announced. **Mr. George Wood,** C.B.E., who has been chairman of the company since 1950, retires from that office as from January 1 next, and has been appointed vice-president. He will remain a director. The new chairman will be **Mr. Harold W. Secker,** O.B.E., who is now joint managing director. In addition, **Mr. Arnold Carr,** who was in charge of the company's London operations prior to his return to Sheffield in 1950, has been appointed assistant managing director, and **Mr. R. F. Stagg** is appointed to the board.

Mr. J. Downie, whose impending retirement at the end of January next we referred to on December 10, has been station superintendent at Dunston 'A' and 'B' power stations, North Eastern Division, B.E.A., since 1951. A Scot, Mr. Downie gained much of his earlier experience as a sea-going engineer, serving with the Cunard Line for several years, including some time in both the old *Mauretania* and *Aquitania*. He left the sea in 1923 to join the staff of the Dunston 'A' power station of the Newcastle-upon-Tyne Electric Supply Co., which later became the North Eastern Electric Supply Co., Ltd. He transferred to Dunston 'B' power station in 1936 as shift charge engineer and was promoted to assistant station superintendent at Dunston 'A', 'B' and Blaydon power stations in 1945, to deputy superintendent there in 1948, and station superintendent in 1951.

Mr. A. W. V. Agutter, of Centaur Tool Works of Birmingham, has been elected president of the British Association of Machine Tool Merchants, with **Mr. A. V. Graves,** of E. H. Jones (Machine Tools) as vice-president.

To mark his 70th birthday, **Mr. Ernest Heaps,** managing director of the Brighton Lighting and Electrical Engineering Co., Ltd., was presented with a silver nut bowl and pewter tankard from the staff. A Lancastrian, Mr. Heaps opened his own factory at Brighton in 1920 after spending several years with Allen West and Co., Ltd.

Mr. J. E. Channing has been appointed representative for Scotland for Nettle Accessories, Ltd. He has previously served with the Lighting Division of Thorn Electrical Industries, Ltd., and more recently with W. U. Mackay and Sons, Ltd., the electrical fittings wholesalers in Glasgow.

Mr. J. E. Channing

From George Pike, Ltd., we hear that **Mr. D. H. Beilby** has now taken over their North Eastern area, and **Mr. J. M. Ward** has been appointed the new manager at Peterborough.

Another honour has been placed on the broad shoulders of **Mr. H. Pryce-Jones,** J.P., M.Eng., M.Inst.C.E., M.I.E.E., M.Inst.F., manager of the Mid-Sussex sub-area of the South Eastern Electricity Board—he was recently invested as the new president of the Brighton, Hove, Worthing and District Electricity Branch of N.A.L.G.O.

Mr. D. R. Mackie, director, and at present also general manager of sales for Monsanto Chemicals, Ltd., has been appointed commercial director of the company. The position of general manager of sales is to be discontinued, and the responsibilities of that office transferred to three sales controllers, **Mr. E. L. Pixton, Mr. D. C. M. Salt** and **Mr. J. S. Hunter,** with **Mr. W. M. Thompson** as director of purchases.

Mr. Paul Evans has been appointed manager for the Scandinavian division of Hoover, Ltd., with headquarters in Copenhagen. He has been with the company since 1949.

His many friends in this country will be glad to hear that **Mr. James F. Magee,** A.S.T.C., A.M.I.E.E., A.M.I.E.(Aust.), has returned to Britain to join the staff of Preece, Cardew and Rider, the consulting engineers. From January 1 next, he will be deputy to Mr. J. Bell in charge of all contract matters, including inspection. Prior to returning to Australia two years ago, he was engineer representative in London for the Sydney County Council for over four years.

Mr. A. G. Grant has been appointed home commercial manager and **Mr. M. H. Reid** planning and overseas commercial manager of the Cape Asbestos Co. **Mr. H. Barty-King** has become publicity manager and **Mr. N. A. C. James** southern area sales manager.

Now district engineer of the Metropolitan-Vickers Electrical Co.'s Erection Department at Cardiff is **Mr. H. J. Davies.** He has succeeded

Mr. T. L. Hutchinson

Mr. H. J. Davies

Mr. T. L. Hutchinson who has retired, but who is retained as a part-time consultant at the Cardiff Erection Department. Mr. Davies received technical training at Glamorganshire Technical College and joined M.-V. in 1919 as an erection engineer. He has been in charge of many contracts in the South Wales area, including turbo-generator installations and mining and rolling-mill contracts. He became assistant district engineer, Cardiff, in 1950. Mr. Hutchinson joined the former British Westinghouse Co. as a school apprentice in 1904. Subsequently he was in charge of the dynamo test (night shift) until 1910, when he went to Bremen, Germany, for the installation of rotary converters and transformers. Returning to the Works he was transferred to the Glasgow Erection Section, and in 1918 was appointed district erection engineer, Cardiff. There he has been associated with many large contracts, including the erection of the first eight 132 kV outdoor substations for the C.E.B. from Swindon to Swansea. The installation of switchgear, turbo-generators, etc., for Portishead and Plymouth power stations also came under his control.

A. Reyrolle and Co. have appointed **Mr. J. S. Hutchinson** as North-East England area manager in charge of all work within the territory covered by the boundaries of the N.E. Electricity Board.

In recognition of his 58 years' service with William McGeoch and Co., Ltd., **Mr. Cyril A. Lloyd,** who recently retired from the position of manager of the company's Ships Electric Fittings Department, was entertained at the company's works a few days ago. On the occasion he received presentations from Mr. W. Percy McGeoch, works managing director, on behalf of the Birmingham directors, and from Mr. C. C. Knowles, works manager, on behalf of the staff and works. Mr. Lloyd, who recently celebrated his 72nd birthday, commenced with the firm at the age of 14. So far, only two other employees of the company have beaten his record of service—the late Mr. William McGeoch who died in 1949 (60 years' service), and Mr. Harry Jinks (64 years' service and still at work).

The three recent awards of the E.A.W. Diploma for Demonstrators are outstanding, for the candidates gained 1st Class passes in all three subjects—cookery and laundry demonstration and salesmanship, and each gained one distinction—**Miss E. S. Petrie** of Aberdeen and **Miss D. M. Goodall** of Thurrock, Essex, in cookery demonstration, and **Miss M. Guymer** of Chelmsford in salesmanship.

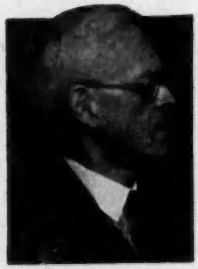
After nearly fifty years' service with St. Helens Corporation, **Mr. T. E. Beeley,** assistant lighting engineer, is shortly to retire.

Three young Glasgow men who joined Hoover (Electric Motors), Ltd., of Cambuslang, Lanarkshire, as graduate apprentices in 1945, have risen to posts of responsibility. They are **Mr. D. McGregor,** who has just been made superintendent of the washing machine motor production line; **Mr. N. McIntosh Hemphill,** who has been appointed chief plant engineer; and **Mr. Ian McGregor,** who is education and training officer.

The Board of H. J. Enthoven and Sons, at the request of **Mr. Keith L. Cobb,** announces that he no longer holds the position of managing director of the company. All connections between Mr. Cobb and the company and its subsidiary and associated concerns have been severed, consequent upon a fundamental disagreement on policy between him and members of the board, it is stated.

Dimplex Ltd. have appointed **Mr. R. C. Flook** as sales manager for Southern England, and he will operate from his home address, 100 Garthorne Road, Forest Hill, London, S.E.23. He was previously assistant buyer in the electrical department of Harrods.

Mr. C. A. Lloyd receiving the presentation, with Mr. I. H. Macqueen (works director) and Mr. A. Stewart (director) on the left, and Mr. W. P. McGeoch (works managing director), Mrs. Lloyd and Mr. C. C. Knowles (works manager) on the right



Mr. F. W. M. Anderson

Mr. G. E. Rhodes

Mr. E. J. Vidler

Mr. F. V. Vaissiere

W. T. Henley's Telegraph Works Co., Ltd., announce the following retirements and appointments, with effect from January 1, 1954:—**Mr. F. W. M. Anderson,** director and general manager, retires from the position of general manager after 47 years with the company. He remains a director, and is retained for special consultation. **Mr. G. E. Rhodes,** retires from the position of deputy general manager after 50 years with the company. As a result of these retirements, **Mr. E. J. Vidler,** the present assistant general manager, is appointed general manager, and **Mr. F. V. Vaissiere,** at present general sales manager, is promoted to assistant general manager. Mr. Anderson has been a director of Henley's since 1947. He joined the company in 1906, and after being assistant sales manager for several years, became sales manager in 1925. In 1937 he was appointed assistant general manager, and six years later succeeded Mr. W. F. Bishop as general manager. Mr. Rhodes was for many years supervisor of export sales before becoming deputy sales manager in 1925. Promotion to assistant general manager followed in 1943, and to deputy general manager in 1950. Mr. Vidler, who becomes general manager, has been assistant general manager since 1950. Earlier he was sales manager for four years, deputy sales manager for six years, and assistant sales manager from 1937 to 1940. Mr. Vassiere has been general sales manager since May, 1950, after four years as chief assistant sales manager.

OBITUARY

Mr. R. S. Whipple, M.I.E.E., who was chairman of the Cambridge Instrument Co., Ltd., from 1939 until 1949, died on December 13, aged 82. He had been associated with the scientific instrument industry since 1896 when he joined L. P. Casella as assistant manager. Two years later he became private assistant to Mr. (later Sir) Horace Darwin, the founder of the Cambridge Instrument Co., and was appointed manager and secretary at the end of that year. From 1909 to 1935 he was a joint managing director of the company.

Mr. J. Hogan, who retired a few months ago from the position of export sales adviser to British Insulated Callender's Cables, Ltd., died on December 14. He joined the former Callender's Cable and Construction Co. in 1902 and, after serving an apprenticeship in various branches and offices, entered the Sales and Estimating Department in London, where he later specialised in overseas contracts. In 1923 he was promoted and took charge of the Overseas Power Cables Department, and later, on its formation, of the Overseas Sales and Estimating Department. He served in that capacity until being appointed export sales adviser a few years ago.

Mr. F. Guise, managing director of the Expanded Metal Co., Ltd., died on December 13, aged 66.

Mr. J. P. Eveson, director of Eveson Bros., Ltd., died on December 12, aged 82.

Mr. R. W. Kennedy, who was editor of the *Electrical Contractor* for 24 years, retiring in 1950, died on December 17, aged 71.

Mr. J. Stephen, who retired early this year from the position of station superintendent at Chamber Hall power station, Bury, North Western Division, B.E.A., died on December 14, aged 65.

Mr. H. L. Bazalgette, A.C.G.I., A.M.Inst.C.E., M.I.E.E., who was manager of the Hydro-Electric Department of the English Electric Co. Ltd., from 1930 until retiring in 1951, died on December 19.

Hon. Eric B. Butler-Henderson, a former chairman of the London Electric Supply Corporation, Ltd., died on December 18, aged 69.

Dr. R. A. Millikan, the well known American physicist, died in California on December 19, aged 85. He was renowned for his researches, beginning in 1906, determining the size of the electric charge of the electron. His later work was on spectra and cosmic rays.

Mr. A. Aspinall, A.M.I.E.E., formerly borough electrical engineer at Brighouse, Yorks., died a few days ago, aged 73. He became chief of the Brighouse electricity undertaking in 1900 at the age of 20, and held that post until retiring in 1946.

Mr. C. J. B. Barlow, M.I.E.E., formerly chairman and managing director of the Warrington Electrical Co., died recently. He was chairman of the Warrington branch of the Electrical Contractors' Association from its formation until 1948, and a past-member of the Council of the E.C.A. He was also for more than 20 years chairman of the Exide service agents' meetings for the North-West area, and was chairman of the Exide Convention held in various parts of the country.

NEW LITERATURE

Television Engineering—Vol. I

by S. W. Amos, B.SC.(HONS.), A.M.I.E.E., *and D. C. Birkinshaw,* M.B.E., M.A., M.I.E.E., *in collaboration with J. L. Bliss,* A.M.I.E.E.

ALTHOUGH this is the first volume of a B.B.C. textbook on television engineering written primarily for the Corporation's staff, its approach and treatment of the subject makes it ideally suitable for the general student who has chosen one of the branches of television engineering as his metier. One of the many admirable characteristics of the work is its lucid, non-mathematical argument, yet for those who wish to pursue the subject deeper, appendices are included for special treatment of those sections requiring particular attention. First of several volumes, this book is concerned with the fundamental principles of producing television pictures, and more specially, camera tubes and television optics. Its introduction discusses the complexities of scanning, synchronising and interlacing, continuing with a brief, but thorough, analysis of signal waveform. On camera tubes, a chapter on general considerations precedes useful discussion of those in use by the B.B.C., placing them in the three main categories — photo emissive, high velocity; photo emissive, low velocity; and photo conductive tubes. In the final section, the initial concern is light and its reflection and refraction, an essential preliminary to the concluding and extensive chapter discussing electron optics, primarily as they affect the operation of camera tabes. Published for the "Wireless World" by Iliffe, 308 pages, 8½ in. by 5½ in. Price 30s.

The Magnetic Amplifier

by J. H. Reyner, A.C.G.I., B.SC., M.I.E.E., M.Inst.R.E.

MAGNETIC amplifiers, or transductors as they are alternatively called, are becoming of ever increasing importance, due mainly to their extreme robustness and small size. In many applications where only occasional operation is required, they have the advantage of extreme reliability and for that reason have been introduced into some types of protective gear. They are also of great use when very low frequency or d.c. voltages may require amplification.

Much of the information dealing with transductors has been published, particularly as advanced mathematical analyses, but in most cases, the presentation presupposed a fundamental knowledge of operation. In 1950 Mr. Reyner brought out the first edition of this book, and since that time considerable extensions of application have been made. Practically, however, the basis of operation has remained the same, and it says much for the original volume that only minor amendments have been necessary in this edition to bring it up to date.

The text covers the principles of the fundamental amplifier; the effect of the B/H curve on response (with the simplified variations of the curve which have been used as a first approximation); characteristic responses, magnetic materials, design relationships and finally some practical applications. Second edition, published by Rockliff Publishing Corp., Salisbury Square, London, 119 pages, 8½ in. by 5½ in. Price 15s.

Fundamentals of Electronic Motion

by Willis W. Harman

THIS can scarcely be regarded as a book for the beginner in electrical engineering, as it is devoted to the analysis of particle dynamics, electromagnetic fields and wave phenomena. Such an attack presupposes a competent mathematical knowledge on the part of the reader. The author points out that skill in analysis is only acquired by practice in analysing new situations. For that reason numerous problems are provided with the specific purpose of "encouraging thought and understanding." As might be expected much of the text is devoted to the problems of motion of free electrons under the influence of magnetic or electrostatic fields, and in such conditions the book naturally provides the electronic engineer with a thorough grounding in the functioning of valves, including cathode ray tubes, klystrons and magnetrons.

The volume ends with a short section on relativistic electrodynamics and their effects on the operation of accelerators. Published by McGraw-Hill Publishing Co. Ltd., 319 pages, 9 in. by 5¾ in. Price 46s. 6d.

BOOKS RECEIVED

A Message Round the World by Marie Neurath. Colour book for children describing world telecommunications, telephony and television. Published by Parrish, 36 pages, 8½ in. by 7¼ in. Price 6s.

The D.C. Shunt Motor, by A. L. Bleak. Attempts a simplified explanation of the behaviour of one type of motor, for students. Published by the author at 21 Tanfield Ave., N.W.2, 26 pages, 7¼ in. by 4¼ in. Price 1s.

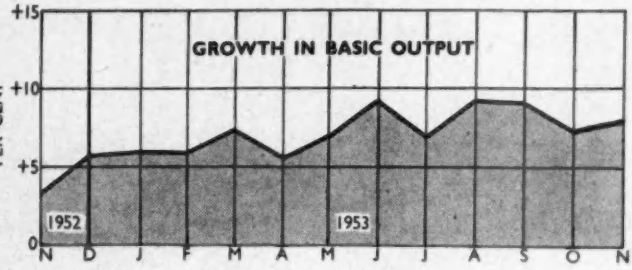
Radio Engineering Vol. I, by E. K. Sandeman. Intended both as textbook for students and reference book for engineers and designers. Second edition, published by Chapman and Hall, 779 pages, 8¼ in. by 5¼ in. Price 60s.

Practical Metrology, Vol. 1, by K. J. Hume and G. H. Sharp. First of four volumes, deals with laboratory experiments related to industrial practice. Published by MacDonald, 60 pages, 7½ in. by 4¼ in. Price 6s.

Motor Cycling Electrical Manual, by B. Osborne. Designed to assist motor cyclists having no electrical experience or knowledge. Published by Temple Press, 128 pages, 7¼ in by 4¼ in. Price 5s.

BASIC LOAD GROWTH

In the accompanying curve is shown how energy sold by the B.E.A. in the past 12 months compares with that of the corresponding month a year earlier. Figures used for plotting are first corrected for the effects of temperature and of the number of working days included in the calendar month. Thus the points marked are an approximate measure of the basic rate of load growth experienced by the B.E.A.



Power Supply in November

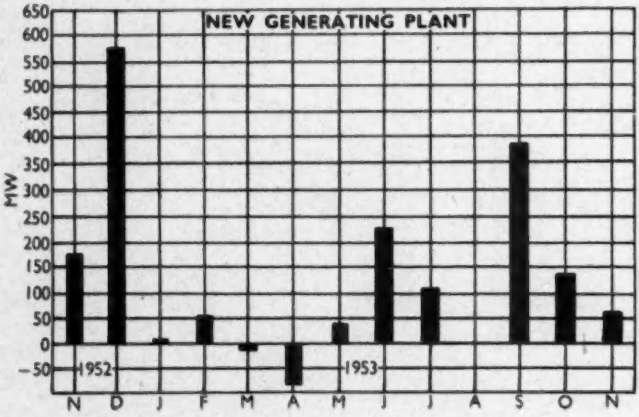
COMMISSIONING by the B.E.A. last month was confined almost entirely to boilers. Six of these are recorded, against one turbo-alternator set—a 60 MW unit for North Tees C generating station, North Eastern Division. Like the three others so far commissioned at this station, this is a Parsons unit, running in conjunction with 360 klb/hr Babcock and Wilcox boilers, at steam conditions of 900 lb/sq in., 925°F at the turbine stop valve. This unit brings the station up to its projected generator capacity.

Turning now to the steam raising plant recorded in November, there are, among the six, two boilers which are the first units to be commissioned at their particular stations. One is at Chadderton station (North Western), having a 360 klb/hr. rating. This is a Simon-Carves unit, and will power 60 MW Metropolitan Vickers sets. Second on the list to record its first unit is Connah's Quay (Merseyside and North Wales). Here the boiler has a 300 klb/hr rating, and is of International Combustion manufacture. Sets here are to be 30 MW Parsons alternators.

Of the four remaining boilers, one is at Carmarthen Bay station in S. Wales Division.

B.E.A. SALES TO AREA BOARDS IN NOVEMBER

Board	Nov. sales in million units	% inc. or dec. on Nov. 1952
London	543·2	— 2·9
South Eastern ...	305·8	— 2·3
Southern	362·8	— 0·1
South Western ...	177·0	+ 3·3
Eastern	502·4	— 1·0
East Midlands ...	420·9	— 0·4
Midlands	582·0	+ 2·4
South Wales	318·4	+10·9
Merseyside and N.W.	317·2	+ 3·5
Yorkshire	558·7	+ 2·8
North Eastern ...	336·1	+ 4·9
North Western ...	626·9	+ 5·9
South-East Scotland...	123·0	+ 4·5
South-West Scotland	297·7	+ 1·5
Direct Sales by B.E.A.	83·2	+28·6
Grand Total ...	5,555·3	+ 2·3

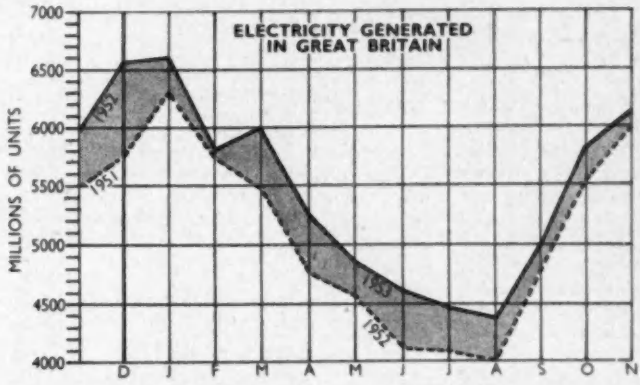


GENERATING PLANT

At the end of October, 1953, the installed capacity of the B.E.A. was 18,090 MW, showing a change of 63 MW during the month. During the same period that of the North of Scotland H.E. Board increased by 1 MW to a total of 567 MW.

The overall increase during the past twelve months is 1,490 MW or 8·7% of the total at November 30, 1952. The B.E.A. total is up by 1,483 MW and the North of Scotland total by 7 MW.

The total installed capacity used for the purposes of this graph is the total m.c.r. of all generating sets which are connected on both steam (if appropriate) and electric sides and are suitable for service.



UNITS GENERATED

Total generation during November amounted to 6,099 million units in stations under the control of the British Electricity Authority and the North of Scotland Hydro-Electric Board. Last year's corresponding figure was 5,947 million units.

Of the November total, 5,900 million units were generated in steam stations, whilst the contribution from hydro-electric stations was 186 million units.

Energy sent out by both authorities during the month totalled 5,743 million units, 94% of that generated.

The unit, 240 klb/hr rating, of Babcock and Wilcox manufacture, is the fourth for the station. Commissioning its second boiler is Carrington station (North Western), this being another by Babcock and Wilcox, and of 360 klb/hr capacity. Also by the same manufacturers is the unit recorded at Rye House, Eastern Division. The fourth boiler for this station, its commissioning increases the steam raising capacity by 350 klb/hr, at t.s.v. conditions of 600 lb/sq in. and 850°F. To complete November's not unimpressive total comes Littlebrook C, where the commissioning of its fourth boiler is a rapid follow-up of the previous month's set. It is an International Combustion unit, rated at 360 klb/hr at the "standard" t.s.v. condition of 900 lb/sq in., 900°F.

When considering energy sales during the month, the most striking feature is the affect the generally higher temperatures have had, when compared against last year. This was to be anticipated, and, naturally enough, those Boards having a comparatively high domestic load are more noticeably affected. With the average temperature (for the five weeks ending December 4th) being 8·2° F above that for the corresponding period last year, national energy sales were 2·3% above those of November last year—comparatively low when measured against the figures for previous months.

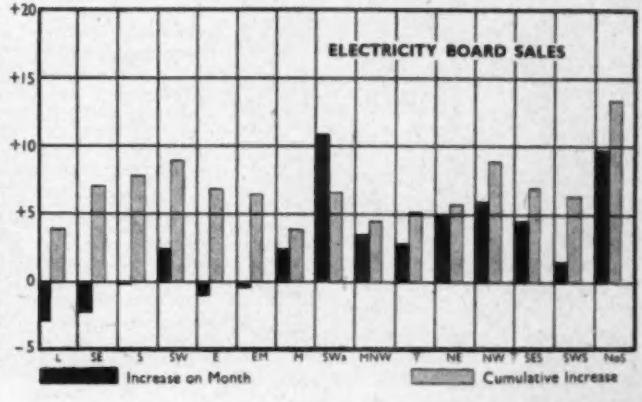
When, however, correction for temperature and the higher number of effective working days are made, the increase in sales over the same month last year is seen to be 8%, which compares favourably with figures obtaining recently.

The higher temperatures also affected total and power station coal stocks which both rose during November. At the end of the month the latter were nearly ½ million tons higher than the corresponding total at the same time last year.

NOVEMBER SALES

Progress in the sales of energy by the British Electricity Area Boards and by the North of Scotland H.E. Board is represented in this diagram. For each entry the two columns indicate, respectively: the bulk supply of electricity taken by the Board (or the total sent out to Areas for the North of Scotland) in November, 1953, expressed as a percentage increase on that in November, 1952; and on the same comparison for cumulative totals based on the financial year.

It should be noted that the B.E.A. financial year runs from April 1, whilst that of the North of Scotland H.E. Board corresponds to the calendar year.



Cost of Nuclear Power

Electrical Aspects of British Atomic Energy Project Debated

SPEAKING last week in a House of Lords debate on the British Atomic Energy project, the Marquess of Salisbury estimated the cost of electricity from plant such as the Calder Hall installation as 1d per unit at the station busbars. This compares with between 0·6 and 0·7d per unit in the newer coal-fired generating stations, but the price of coal might be expected to rise, whereas that of nuclear based electricity should drop. In particular, the fast breeder reactor promised much in the way of reduced prices.

Lord Salisbury, who is the Minister now responsible for Atomic Energy, went on to say that "if we can live up to a programme which is already under examination there is no reason according to the estimate I have received, why by far the greater part of the country's electricity should not be generated from atomic energy by the year 2000." He emphasised that this was in the nature of a guess.

Two Stations

The 50 MW of atomic generating plant which had been mentioned in the House of Commons, he said, covered both the Calder Hall thermal reactor, and the proposed breeder reactor station—this was in part a reply to Viscount Falmouth, who had initiated the debate and had criticised the establishment of an experimental station as large as 50 MW.

Lord Salisbury said that it was far too early as yet to make any statement about the nature of the relations in the future between the B.E.A. and the Atomic Energy Corporation—whether the B.E.A. will build all their own atomic power stations to designs developed by the Corporation, or whether they will take some electricity from plants run by the Corporation primarily for military or research purposes.

In his opening speech, Viscount Falmouth had pointed out that the thermal efficiency of the proposed nuclear plant would be only some 20-25%, because the aluminium canisters for the uranium cannot stand high temperatures. Viscount Falmouth also pleaded for a technologist to be appointed as head of the proposed atomic energy corporation. "You want the man in charge," he said, "to be able to encourage the crew."

On the subject of secrecy, he criticised the attitude of H.M. Government. He asked that the distinguished scientists in official employment should be free to express their own views on some of the problems of the non-military aspects of atomic energy. Moreover, the secrecy was keeping many brilliant scientists and engineers from helping to develop the peaceful applications of atomic energy.

There were many other speakers in the debate, most of them being concerned with the organisation of the proposed Corporation. In his final reply, the Marquess of Salisbury promised that the remarks on secrecy would receive careful consideration.

BRITISH STANDARDS

Methods of Testing Raw Rubber and Unvulcanised Compounded Rubber. Part 4. *B.S.*1673: *Part* 4:1953. *Price* 3*s.* 6*d. net.* Part 4 of this standard evaluates vulcanising characteristics. It gives methods applicable to raw rubber, and intended for use in evaluating such rubber on the basis of technically important characteristics. Specified in the standard are the test mix and vulcanisation conditions to be used. The scorch test for unvulcanised compounded stock, and procedures for other tests on the vulcanisate are described.

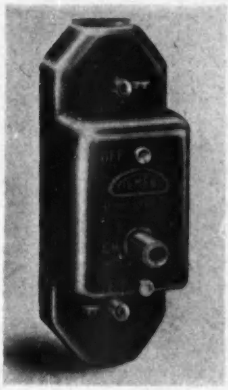
Preferred Numbers. *B.S.*2045: 1953. *Price* 2*s.* 6*d.* Whilst the technical features, advantages and practical applications of the numbers given in this standard have already been discussed (B.S.1638: 1950), the numbers are now given authoritative status for their application to British practice by the publication of this standard. Information on the numbers themselves is also of course, now readily accessible. Preferred numbers (identical with those agreed internationally by I.S.O.) are given in four principal series (R5, R10, R20, and R40) and in the additional R80 series intended for special application. The method of obtaining supplementary series of any desired step ratio is also explained.

Tolerances for Mouldings in Thermosetting Materials. *B.S.*2026: 1953. *Price* 3*s.* In view of the previous arbitrary practice in specifying tolerances which bear no relation to conditions peculiar to plastics moulding, this standard draws up a system of standard tolerances on a technical basis. Four classes of tolerance are provided, with examples of calculating the tolerance for specific items.

The BUYER'S *Column*

New Siemen's Earth Leakage c.b.

THE development of an earth leakage circuit-breaker, designed to conform with B.S.S. 842/1939 and regulation 404J of the I.E.E. wiring rules, has been announced by SIEMENS ELECTRIC LAMPS AND SUPPLIES LTD., 38-39 Upper Thames St., London, E.C.4.



Siemens new c.b.

This improved design embraces a more robust tripping mechanism less likely to be affected by variations of temperature, dampness or ingress of dust, etc. The trip coil operates at 24 volts leakage potential at which voltage the armature is brought into the field of a strong permanent magnet which exerts the pull tripping the mechanism.

All parts are of sturdy construction and heavily protected, whilst the case consists of a robust Bakelite moulding with separate extended terminal covers for use with T.R.S. cable or conduit.

Provision is made for adding differential coil overload protection, two sizes of coil being available. 45 amps is the standard size but a 30 amp coil can be supplied.

The circuit-breaker is suitable for use as a consumer's main switch in small dwellings, particularly in rural areas where low resistance earth connections are unobtainable. It can also be used for the protection of farm equipment, small motors and tools and other industrial applications.

G.E.C. Range Increased

THE range of fluorescent lighting fittings with one-piece pressed steel or "Perspex" reflectors, marketed by THE GENERAL ELECTRIC CO. LTD., Magnet House, W.C.2, now covers 4 ft and 3 ft fittings in addition to the original 5 ft model.

The metal reflectors in this range are now made with louvred slots for upward illumination. Closed top reflectors can be supplied if particularly specified.

Fully Impregnated Non-Draining Cables

WE have received from W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 Hatton Garden, E.C.1, advance details of their Fully Impregnated Non-Draining type cables which although primarily intended for vertical runs and similar situations, are also suitable for normal industrial use. Henley "F.I.N.D." cables are available for standard voltages up to and including 11 kV and cost no more than standard cables.

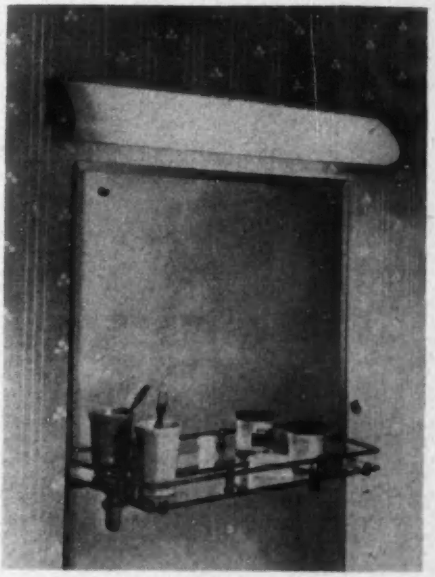
Atlas "Pin-up" Fitting

A NEW wall mounting fluorescent lighting unit has just been released by THORN ELECTRICAL INDUSTRIES LTD., 105 Judd Street, W.C.1.

This fitting, the Atlas GU/0020, accommodates a single 20 watt tube behind a peach tinted plastic diffuser. The high power factor, choke ballast and starter switch control gear ensures low running costs. With an Atlas "White (3,500°K)" tube the light output is equal to that of a 75 watt bulb yet the total consumption is only 28 watts inclusive of control gear losses.

Designed for use in the home over shaving mirrors, as a bedlight, to illuminate pictures or for similar purposes, the GU/0020 is also invaluable in commercial and industrial fields for the illumination of notice-boards, display panels.

Special attention has been given to ease of installation. Two 1½" No. 8 screws, set 20" apart, are all that is needed and keyhole slots in the chassis enable the fitting to be hung on the screwheads. It is this ease of installation which has led to the use of the name "Pin-up." Electrical connections are just as simple as for an ordinary light bulb and, if required, a cord pull switch can be provided at a small additional cost.

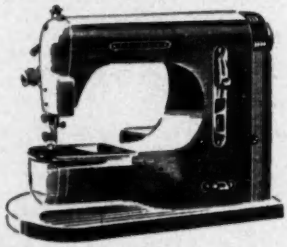


Atlas fitting lightly "pinned" in place

At a list price of only 89s. 6d. (incl. 7s. purchase tax), this fitting compares favourably with tungsten filament fittings for similar duties. The 2 ft 20 watt Atlas tubes, which are available in all the standard "whites" are listed at 12s. 3½d. including purchase tax.

The Fridor Sewing Machine

A PRECISION sewing machine of Swiss/Dutch manufacture is now available in this country distributed solely by G. A. DISTRIBUTORS LTD., 29 Whitehall, London, S.W.1.



The Fridor is streamlined and easy to clean

An extremely attractive machine in a streamline apple green fairing, the Fridor machine is priced £58 16s. retail including tax. Apart from its design, which is pleasing to the eye, the Fridor is power operated, has a detachable work table, built-in 6V light to shine on work and avoid troublesome shadow when doing intricate sewing, a knee-operated speed control, a stitch regulating lever and probably most important, the Fridor darning arm.

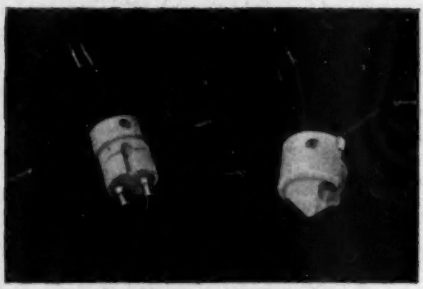
Thus the one sewing machine supplied complete with an attractive leather carrying case and six assorted sewing feet in handy small parts case, can handle with ease the darning of socks and stockings, zig-zag sewing, sewing knitted wear, darning of linen, embroidering and monogram work, buttonholing, chain stitching, guilting, appliqué work, sewing crimped elastic, and hemming.

New Porcelains for Nettle Goods

IN their block pattern range of accessories which are now well known in the trade, NETTLE ACCESSORIES LTD., Harper Road, Wythenshawe, Manchester, have now incorporated new pattern interiors made of porcelain.

In two items of their range, viz., the batten lampholder and the three-terminal ceiling rose, they have completely shrouded the looping in terminal in the front by porcelain. This is to prevent any person inserting scissors, pieces of wire or other foreign bodies. It is now impossible for anything extraneous to come into contact with the "live" terminal.

In the photograph the three-terminal interior of the batten lampholder is shown on the left and the three-terminal ceiling rose interior used in the company's Ref. 23 accessories on the right.



Newly designed Nettle porcelains

Linolite Price Change

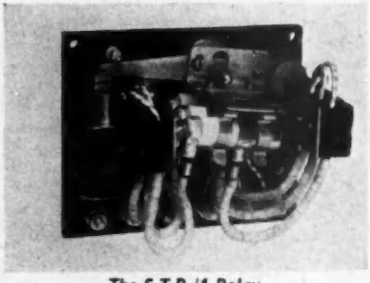
THE revised price list for their products issued by LINOLITE LTD., 118 Baker Street, London, W.1, shows that as compared with their 1952 September price list type AS fittings and Linora standard reflectors have been reduced in price whilst Linora weatherproof fittings have been increased in price.

Modified S.T.R. Relay

A MODIFICATION of the S.T.R. relay known as the S.T.R./1 relay has been introduced by ELECTRO-MAGNETIC CONTROL CO., 17 Leigh Road, Leyton, E.10.

This new relay can be fitted with one, two or three mercury switches and can be arranged to make or break a circuit upon the energising of the coil with a maximum of 30 amps loading on voltages up to 400 V a.c. With a 200-220 V operating coil the current consumption is 18 mA and with 230-250 V operating coil consumption is 17 mA.

Panel dimensions are 6″×5″ with fixing centres 5½″×4½″. As shown in the illustration the instrument is mounted horizontally; clearance from the back of the panel to the foremost point of the front is 4″.



The S.T.R./1 Relay

It is emphasised that with the S.T.R./1 relay, certain equipment which previously used a pilot relay operating a main contactor can now use the single unit to control the load, thus cutting the expense involved in installation.

These S.T.R./1 relays are especially sensitive and are suitable for use with contact thermometers and temperature control apparatus.

The WEEK in NEWS

Good News for Exporters to Australia

Further Relaxation of Import Ban expected Soon

THERE is encouraging news for those manufacturers and exporters still affected by the import restrictions imposed by the Australian Government originally early in 1952. At that time it was promised that the situation would be constantly reviewed, and this promise has been rigidly adhered to, to the extent that there have been three relaxations of the restrictions this year. When the last relaxations were announced last September, Mr. Menzies said the remaining restrictions would be examined at the end of the year. This is certain to be done, not only because the promise has been made, but also because the matter will come under consideration preparatory to the Commonwealth Finance Ministers' Conference, to be held in Sydney next month.

Although total abolition of the import restrictions may be too much to hope for at one time, Australia's latest trade figures indicate that some easement will be possible. Dollar imports appear likely to be kept at the same level, but more freedom in respect of goods from the sterling area and Europe is confidently expected. In fact an authoritative source in Canberra anticipates an announcement shortly lifting the ban on sterling goods altogether. This will probably be done in two stages, the first in January and the second about Easter.

U.K. FIRM SECURES GREEK CONTRACT

FROM a very early date after the formulation of plans for a vast new power scheme in Greece, it became obvious that there would be keen competition from all parts of the world to secure contracts. The Greek electric power programme includes the construction of four power stations, some 700 miles of 150 V transmission lines and 18 substations to transform current to 15 kV for primary distribution. We hear that a contract for some 3,400 15 kV expulsion fuse switches has recently been placed with Line Equipment Ltd. This order is valued at about $56,000.

Iron and Steel Exports

THE basis of valuation for some iron and steel goods which may be exported without a licence has been altered. As from last Monday these goods may be exported without a licence provided the value of the articles exceeds the value of the iron and steel content calculated at the rate of £20 per ton. Previously the rate was £30. Exports to China, Hong Kong, Macao and Tibet, are not affected.

Electrical Progress of Colombo Plan

THE original Colombo Plan provided for a six year period starting in 1950. The completion of one-third of that period is reviewed in the annual report of the Consultative Committee on Economic Development in South and South-East Asia, just published. In the sphere of electrical progress, there is noted an increase of 315 MW in generating capacity in India, of 25 MW in Ceylon, of 70 MW in Pakistan, of 50 MW in Singapore, of 40 MW in Malaya, in addition to smaller schemes elsewhere.

There are, of course, many other large power projects in the course of development, such as the Damodar Valley and Bhakri-Nangal schemes in India, Norton Bridge stage II in Ceylon, the Mianwali and Karnafuli hydro-electric schemes in Pakistan, while surveys are also being carried out in Burma for water-power development. The report outlines the progress made in such economic developments, giving brief particulars of some of the schemes and an indication of the countries contributing technical and other assistance.

The First Half-Century

Westward Ho! Whoso wants to join the Institution trip to America next year had better buy a big money box and start saving. According to the circular just issued he will need £80, plus £10 for tips, etc., and £x for "wines and the like." (Does "the like" include the cost of interviewing the customs officials?) The trip will begin about the end of August and will take between five and six weeks in all. Ladies are eligible, but you must state their relationship to you on the form provided by the secretary. The Council will not proceed to allotment unless at least forty applications are received. Probably this minimum will easily be passed.—*From our issue of December 24, 1903.*

Bradford planning 20 Smokeless Zones

ANOTHER Yorkshire city has formulated detailed plans for the establishment of smokeless zones. Only three weeks ago we reported proposals which were to be submitted to Leeds Corporation for the promotion of a bill to reduce smoke pollution. We now hear that Bradford's health committee are recommending that an order be made under the 1949 Bradford Corpn. Act prohibiting the emission of smoke from any premises in 20 zones in the city. One of these zones covers the central area and the remainder housing estates on the outskirts. The recommendation has yet to go before the Estimates subcommittee.

We understand that the suggestions have been approved in principle by the Ministry of Housing and Local Government. In addition, discussions with representatives of trade and industry have resulted in the promise of full co-operation. The contemplation of these smokeless zones has been facilitated by the policy of installing special appliances in every post-war council house, and of making agreements with tenants that only smokeless fuels should be burned. The prohibition of smoke on housing estates will therefore involve no hardship or expense.

Higher Technology Courses in London

PART II of the Bulletin of Special Courses in Higher Technology, organised by the London and Home Counties Regional Advisory Council for Higher Technological Education, was issued last week. It covers courses to be given at colleges in the area during next spring and summer. There are 26 colleges and similar institutions in this area and, needless to say, between them they provide a large number of courses on electrical subjects. All courses and colleges are helpfully indexed in the Bulletin which is available from the Council's secretary at Tavistock House South, Tavistock Square, W.C.1.

Powder Metallurgy

BATTERSEA Polytechnic has arranged a programme of lectures on "Powder Metallurgy," which will begin on January 12. The course consists of a total of eleven talks, all of which will take place on successive Tuesday evenings. We understand accommodation is limited and early application to the Course Secretary is advised. Fee for the series is 25s.

OFFICIAL PUBLICATIONS

COLOMBO PLAN. Second annual report published as White Paper (*see page* 1201). H.M.S.O. 3s. 6d. Also PROGRESS IN ASIA, a review of the Colombo plan. H.M.S.O. 1s. 6d.

STATISTICAL ABSTRACT for COMMONWEALTH and STERLING AREA. H.M.S.O. 15s.

NAT. RESEARCH DEVELOPMENT CORPN. Report and Accounts for 1952-53 (*see page* 1203). H.M.S.O. 9d.

RURAL ELECTRIFICATION. Report of work of Econ. Commission for Europe. Part 1, 6s.; part 2, 2s. Available from European Office of U.N. (Sales Section), Geneva.

NATIONAL PARKS COMMISSION Fourth report for year ending Sept. 30, 1953. H.M.S.O. 2s. 6d.

Civil Engineers' Christmas Lectures

ANOTHER organisation, apart from those mentioned in our November 26 issue, has announced arrangements for their series of Christmas lectures. The three talks being organised by the Institution of Civil Engineers should appeal strongly to those boys interested in marine engineering. Lectures on "Marine Salvage Operations" (Cdre. T. McKenzie), "Diving in the Royal Navy" (Lt. Cdr. G. H. Lawther), and "Harnessing Water and Power Development" (T. A. L. Paton), will be given at the Institution on December 29, 30 and 31 respectively (3 p.m.). These talks are intended for boys aged between 13 and 17, and tickets may be obtained (free) from the organisers.

Manchester Directory

THE Manchester Chamber of Commerce has just published its Directory for 1953-54. It is a handsome volume and should be of great assistance to businessmen. There is an alphabetical list of the Chamber's 5,000 members, and a classified trade index comprising 130,000 entries under a thousand main headings. Price is 10s.

Record for 1954 Electrical Exhibition

CHRISTMAS inevitably fills our thoughts at the moment to the exclusion of almost everything else. The festival over, however, we will probably be taken aback with the realisation that the Electrical Engineers' Exhibition, one of the highlights of the industry's year is less than three months away. Preparations for the 1954 Exhibition are going ahead however and we understand records are being broken in applications for space. A few days ago over 160 entries had been received from manufacturers and Associations. Reserved stand space has now doubled the area of last March's exhibition, and altogether, the 1954 display of electrical goods is calculated to cover nearly 150,000 sq.ft. This includes the two Switchgear Avenues which will be the special features of next March's show. The largest stands cover an area of over 1,500 sq ft.

A strong indication of the importance which is now being attached to this exhibition is the stated intention of several manufacturers that they intend to present new equipment for the first time at the 1954 event. As last year awards will again be presented for the outstanding technical and domestic displays. Dominating the exhibition next year will be an enlarged emblem. This new emblem is expected to be made available to all members of the A.S.E.E. shortly.

Govt. Patents—Another Year of Progress

NATIONAL RESEARCH CORPN. ISSUE FOURTH REPORT

TWO hundred and fifty licence agreements with industry were being operated by the National Research Development Corporation at the end of its fourth year of operations, according to the recently issued annual report for the year ended 30 June, 1953. These agreements involve the administration of 2,224 patents and patent applications in this country and overseas.

The main task of the corporation is the administration of patents resulting from "public" research, such as that carried out by Government departments, and the securing of the exploitation of such patents. However, it may become involved in the development of private inventions where this is in the public interest, and where industry is not undertaking such development.

At present the Corporation is concerned in fourteen development programmes. The only one of these which is directly electrical is that relating to electrical digital computors. Work has continued on four large machines commissioned by the Corporation similar to that designed at Manchester by Professor F. C. Williams, and orders have been received for three of them; one of the orders being for export. In addition, a prototype smaller machine has been manufactured, and is at present undergoing trials at Cambridge University. This digital computor work remains the Corporation's largest single commitment.

During the year under review, the Corporation had running expenses of £120,790 and against this there were receipts for £23,333. What are termed "recurrent receipts," e.g., those from royalties, have increased steadily since the formation of the Corporation, and this is regarded as an encouraging sign.

New H.Q. for Eire Electricity Board

EIRE'S Electricity Supply Board plans for a new multi-storey office block in Dublin will begin to take effect very soon now that excavations on the site have begun. The provision of additional and more modern accommodation has become essential in recent years following the rapid expansion of the Board particularly in development of rural electrification. The building, with frontages in Upper Mount St. and Lower Fitzwilliam St., will have six storeys—the ground, first and second floors dealing with accounts for the whole country. The entire block will be heated by low pressure hot water radiators fed from two storage cylinders, electrically heated during off-peak hours. We understand that thermal storage equipment is being supplied by Bastian and Allen Ltd.

Ship Canal Cables

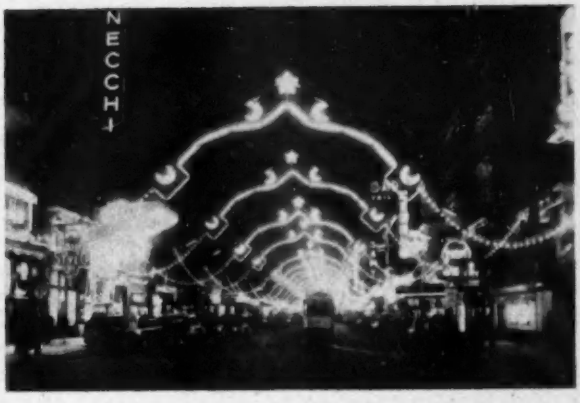
IN the description, published in our issue of December 3rd, of the T.C.M. polythene insulated cables run under the Manchester Ship Canal, the depth of the shafts leading to the low level subway should have been stated as 70 ft. The light-weight, non-draining characteristics of the polythene cables are, of course, well suited for this duty.

U.K. Contract for Baghdad Royal Palace

CONTRACT for the installation of electrical services in the new Royal Palace in Baghdad has been awarded to a British company. James Kilpatrick and Son Ltd. of Paisley, announcing their success in winning this order, state the work is valued at about £200,000. The firm's engineers will be sent out to Iraq to control and supervise the work, which is expected to begin early next year. In addition to the installation of general lighting and power, the work involves special decorative and floodlighting in the gardens and palm plantations, and underwater lighting in the fountain courts. Electric clocks, telephones, fire alarms, servants' call and other systems are also to be installed in the new Palace. The coronation of Iraq's new King, H.M. Faisal II took place earlier this year.

CHRISTMAS IN BRUSSELS

A capital city which captures the festive spirit of Christmas is Brussels. Our illustration depicts one of the main thoroughfares of the capital which has been transformed into a fairyland of lights, forming part of the extensive illuminations installed as Christmas decorations. It has been suggested that other major cities in the world might follow the Belgians' example by decorating their streets in this way



Over-Anxious Customer

SHOWROOM staff at the Southern Electricity Board's premises in Oxford were surprised recently by a forceful customer who crashed his vehicle into the front window. As soon as the dust and debris had settled, a large notice was placed in the draughty aperture advising other customers: "*You* need not come through the window for *your* electric cooker." Needless to say, this unusual advertisement attracted plenty of attention and laughs.

Free Beer and Supper

THERE were celebrations recently at the Rose and Crown at Cop Hill, a small Colne Valley hamlet in Yorkshire. Customers were provided with free beer and a special dumpling-stew supper by the landlord of the inn. Reason for these festivities was that electricity had just been installed. An arrangement with Electricity Boards for knowledge of similar installations might be advantageous.

Easier Christmas Shopping

EVER found yourself overladen with parcels, holly, a Christmas tree and the rest, and staggering homewards after a "successful" shopping expedition? California has supplied the answer — an electrically driven shopping cart to attract male shoppers. One wonders if stores of the future will provide for this increase in traffic with police on point duty, zebra crossings and traffic lights.

An attractive new showcard recently made available to dealers by Chloride Batteries Ltd.

"Electric Knight-Light"

THE career of Sir William Siemens, founder of the famed manufacturing concern which bears his name, was the subject of a broadcast in the B.B.C.'s Home Service earlier this month. The remarkable story traced the fortunes of a man who landed in this country in 1843 almost penniless; through nine years of progress until he set himself up in business on his own account, then reaches an almost fictional climax with a knighthood by Queen Victoria in 1883. *Punch* commemorated the occasion with an appropriate cartoon captioned "The Electric Knight-Light."

NEWS IN BRIEF

Full report of the F.B.I. Export Sales Conference held at Buxton between October 30 and November 1 has been published in booklet form. The report, entitled "Exports in a Buyers' Market", is available from the Federation at 3s. 6d.

Once again the selling price for tungsten ores of standard 65% grade and ordinary quality has been reduced. Woolframite goes down by 10s. to 185s. and Scheelite by the same amount to 170s. per long ton unit delivered consumers' works.

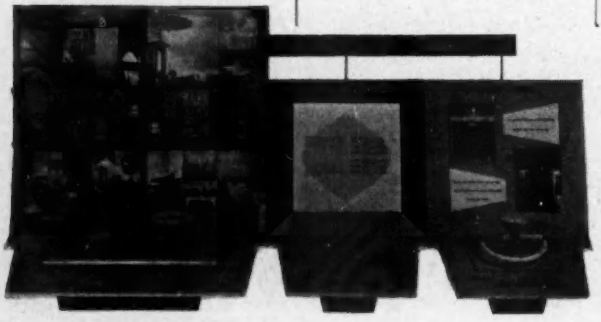
Telcon's annual dinner and cabaret was held recently at Claridges.

The planning and preparation of Coronation Day broadcasts is the subject of a book published by the B.B.C. last week. The intricacies of arrangement for possibly the most outstanding series of programmes ever undertaken, plus arrangements for reception overseas, with some memorable photographs, are all recorded in *The Year that Made the Day.*

Temporary television station near Douglas, Isle of Man, was brought into service on Sunday.

To concentrate attention on the advantages glass has as a medium for lighting, certain members of the Glass Manufacturers' Federation are introducing labels for lighting glass leaving their works.

Foreman's section of Telcon's Staff Association held their sixth annual dinner recently.



This illuminated display has been produced by Siemens Electric Lamps and Supplies, Ltd. for display in showrooms of the S. Eastern Electricity Board. Theme is the domestic lighting and the use of the appropriate lamp in a number of circumstances. The three units are interchangeable thus facilitating adaptability for various windows. Photographic home interiors on the left are illuminated by concealed lighting, which also lights the windows of the houses on the 'street'

Questions in Parliament . . .

Standard Bulk Supply Charges

Two questions were asked last week asking the Minister of Fuel and Power to direct the B.E.A. to make uniform charges to all Area Boards for power supplied. Mr. Joynson-Hicks stated that charges varied according to the cost of coal used in generating stations in the area concerned and there was no intention of varying that practice.

Wires and Cables

Mr. Duncan Sandys said he hoped to be in a position soon to announce the Government's conclusions on the Monopolies Commission's recommendations on the supply of insulated electric wires and cable.

Atomic Research Expenditure

It was impossible to make an accurate assessment of the cost of research into the industrial uses of atomic energy, Mr. A. R. W. Low, Parliamentary Secretary to the M.o.S. said last week. Members were assured that a high proportion of expenditure did in fact go to civil applications.

Technological Education

Anxiety as to the flow of adequately qualified students into universities and other institutions was the basis of a number of questions put to the Chancellor of the Exchequer at question time last week. Mr. M. MacPherson asked how Government plans for the development of higher technological education were going to obtain an adequate flow. He was told that the plans will afford improved facilities for both post-graduate and undergraduate students.

The Minister of Education gave some details of the disposal of the £130,000 allocated for technical education. She said both the College of Aeronautics, Cranfield, and Loughborough College of Technology had accepted £50,000 to endow a senior teaching post in industrial engineering. £15,000 would be spent on scholarships for persons in industry to attend courses in work study. A further £15,000 had been allocated for scholarships in personnel management.

Smoke Abatement

Mr. Dodds sought an explanation last week as to why an Exchequer grant had been refused to the Smoke Abatement Society at present in view of the recommendation of leading fuel experts that such financial assistance should be given. The Housing Minister replied that the Society's independence, financed as it was by subscriptions, was one of its assets. Furthermore, a new organisation had just been formed to develop the fuel efficiency advisory service.

Thames Pollution

The Housing Minister made a statement on the research being carried out into the prevention of river pollution. The statement concerned the River Thames particularly. Research covered such things as quantities, temperature, and chemical and biological condition, of the water and of discharges from sewage works, industrial premises, gasworks and power stations. Much of it, he said, was fundamental research being undertaken for the first time. Major cause of complaints as regards the Thames was, however, the need for purification of London's sewage, and a £12 million improvement scheme had now been authorised, and was due to begin early next year.

Smokeless Zones

A list of local authorities having powers to establish smokeless zones was published in *Hansard* last week. Fifteen authorities are named: Bolton, Bradford, Coventry, Manchester, Oxford, Preston, Rochdale, Salford, Sunderland, Wolverhampton, Crewe, Swindon, Tottenham, Urmston and West Bridgford. Zones had been established in Coventry and Manchester.

Lighting Royal Parks

The Minister of Works' attention was drawn to the alleged inadequacy of main road lighting in the Royal Parks. He was asked if gaslights could be replaced by electricity. Sir David Eccles agreed that lighting along East Carriage Drive in Hyde Park needed improvement, and a scheme was being prepared, but he warned that it would be costly. Sir David went on to say that when that scheme was completed, other improvements would be considered. He added that they had to change from gas to electricity and he thought an attractive form of lighting could be devised.

Hire Purchase

The Chancellor was asked last week if he would endeavour to remove some of the restrictions imposed on hire purchase in the next Budget. Mr. Butler said the restrictions were constantly reviewed, but, of course, the Budget statement could not be anticipated.

Accidents due to O.H. Cables

Following the question regarding the number of fatalities caused in industry by apparatus coming into contact with o.h. electric cables (reported in our December 10 issue), Mr. Skeffington wanted to know similar numbers of non-fatal accidents. He was told there was one such accident in 1938, none in either 1946 or 1951, five in 1950 and six last year. Figures concern premises subject to the Factories Acts.

TV Advisory Committee Reports

The report of the Television Advisory Committee on the form of modulation for sound broadcasting on v.h.f. was to be submitted to the Postmaster-General last week.

In another written answer Mr. Gammans said it would take about seven years to make the whole of Band 3 available for television, as previously recommended by the committee.

Electric Supply News . . .

Belfast

At a special meeting last week, the Corporation decided to re-advertise for tenders for boiler plant for the extension of the municipal West power station. Applicants who respond for tender documents are to be informed that where a particular make of equipment was called for in the specification, tenderers, if they so desire, could offer as an alternative similar equipment of other make, approved by the Council after consultation with the consulting engineers. A proposal that the matter should be referred back to the Electricity Committee to ask the Ministry of Commerce to examine the whole position and make a recommendation which would enable the Corporation to place orders without further delay, was rejected by 25 votes to 10. Councillor Geddes, chairman of the Electricity Committee, after outlining events of the past few months, explained that tenders for the stoker-fired boiler units were invited by public advertisement in October. But it appeared that three of the prospective tenderers had difficulty in procuring quotations from Babcock and Wilcox for their stokers, which were specified, because that firm were of the opinion that they had a contract with the Corporation for the boiler plant, including the stokers. According to Alderman M'Kee, five tenders had so far been received for the supply of the boiler plant. He thought that the Council should have been told earlier by the consulting engineers that Babcock and Wilcox had preferred not to quote some other firms for supplying their stokers. Instead, the consultants advised prospective tenderers to submit offers for an alternative make, although the specification did not provide for any such alternative, he added.

It was later pointed out by Councillor Geddes that in specifying Babcock and Wilcox stokers, the consultants were following precedent. Since 1937 only stokers of that type had been employed at the East power station, and for four boilers being installed at the West station they had been specified, making 24 out of 32.

After Sir William Neill had asked if the Council could have guidance from the town solicitor as to whether Babcock and Wilcox had a case against the Corporation, the town solicitor, Mr. Love, stated that the Electricity Committee had been informed that counsel had advised that the Corporation were under no legal liability to tenderers, including Babcock and Wilcox, and that he had so informed that firm and their legal advisers.

Kincardine

The new power station which the B.E.A. propose to erect at Kincardine, is likely to have 120 MW reheat units installed. The ultimate capacity of the station has not yet been settled, we gather. The B.E.A. has agreed on the Kincardine site in preference to one at Methill on the other side of the Forth, which was earlier proposed.

Lincoln

The B.E.A. has now been given approval by the Ministry of Fuel and Power to proceed with extensions to the St. Swithin's power station, which were the subject of a public inquiry at the beginning of November. Two 20 MW sets and four 120 klb/hr boilers are to be installed, bringing the installed capacity up to 86 MW.

Spray eliminators are to be fitted to the existing cooling towers and similar apparatus will be incorporated in the two new towns.

Mexborough

The B.E.A. has received approval of the Ministry of Fuel and Power to extend Mexborough power station by installing two 30 MW sets and three 180 klb/hr boilers, raising the station's installed capacity to 120 MW.

Kenilworth

The East Midland Electricity Board has agreed with Kenilworth U.D.C. that the electricity supply in that region is unsatisfactory, and the Board is to make efforts to bring about a temporary improvement while preparing a major scheme to permanently reinforce the supply.

Wester Ross

A further extension of their northern network was completed last week by the North of Scotland Hydro-Electric Board, when the overhead line from Glassarnock to Ullapool was switched on. This will enable consumers in the Ullapool-Achiltibuie-Lochinver area to be supplied from the main hydro-electric stations on the Highland grid. The diesel generating station at Ullapool has been shut down, and the consumers affected who previously received power at diesel tariffs will, from their next meter reading, receive their supply at the cheaper hydro-electric rates.

LIGHTING SCHEMES

Darlington.—T.C. has submitted to M.O.T. for approval. a £4,500 scheme for improving street lighting in Coniscliffe Road. It is also proposed to spend £2,600 improving the lighting in Farndale Crescent, Lunedale Road, at Nickstream housing estate, Swaledale Avenue, and Yoredale Avenue.

Oxford.—The Highways Committee are considering two schemes for improved lighting in Oxford Road.

Rochford (Essex).—The C.C. has approved the Parish Council's plan to convert street lighting to electricity.

Ripon.—The Street Lighting Sub-Committee is to draw up a programme for improving street lighting, and including the change over from gas to electricity.

Company Activities . . .

Barton and Sons, Ltd.

The recent rights issue of 975,000 5s. Ordinary shares at 9s. 3d. was oversubscribed, the directors report. Excess applications up to 100 shares have been allotted in full.

Brecknell, Munro and Rogers

For the year ended September 30 last the net profit amounted to £31,730 as against £28,637 for the previous period. The dividend is again 33⅓%.

Burgess Products Co.

At £265,224 the group profit for the year ended July 31 last is nearly £50,000 higher than for the previous year. After charging depreciation, taxation, etc., the net profit becomes £85,103 (£75,054). According to the chairman, Mr. E. T. L. Cotton, the second complete year as a public company was notable as a period of record production, in the achievement of which every manufacturing division again played an important part. Two main factors contributed to the record—a greater availability of materials and greater plant productivity resulting from extensions to Hinckley works. The directors intend to submit to shareholders in the near future a proposal for capitalisation of some portion of the reserves.

Contactor Switchgear

Dealings commenced this week in the 5s. Ordinary shares of this company about 160,000 of which have been placed on the market. The directors forecast that for the year ended July 31 next the profit should not be less than the average for the past four years. The company has a satisfactory order book and turnover is well maintained. On the basis of an estimated profit, subject to tax, of just over £92,000, the board intend to pay a dividend of 22½%. This would be covered roughly twice over by the estimated net earnings.

Crabtree Electrical Industries Ltd.

Trade is undoubtedly better than at this time last year, Dr. H. Schofield, the chairman, stated at this meeting last Thursday. Since the end of July last, the company has experienced a greater demand for its products than in the corresponding period last year. That condition still obtains, and he looks forward to the future with confidence. The company's range of accessories and switchgear was extended during the past year, and further new products are coming out in the immediate future, he added.

Dewhurst and Partner Ltd.

The past year's results were achieved despite the fact that early in the period a substantial wage advance was granted but without any increase being made in sales prices. But Mr. M. Dewhurst, the chairman, is apprehensive lest any further wage increase is granted which would affect the company's ability to compete for export business. The balance sheet shows that stock and work in progress, at September 30 last, was valued at £93,966—over £50,000 lower than a year previously. This has been made possible, Mr. Dewhurst points out, by the improved layout of factory and offices, which has brought a reduction in the average time taken for equipment to pass through the works.

Year to Sep. 30	£ Trading Profit	£ Net Profit	% on Ord. Earn'd	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	77,062	32,125	97	30	8/10	7/7
1950	86,806	36,738	111	35	9/10	7/9
1951	117,309	41,264	44*	22½†	4/9	3/3
1952	172,735	52,476	55	19	5/4	3/11
1953	169,336	46,806	47	19	6/1	5/-

* On larger capital. † Plus 200% capital bonus.

Electrical Apparatus Co.

The results for the year ended July 31 last we noted last week. The directors now state that trade results since the date of the accounts compare favourably with the corresponding period last year. Business secured so far for E.A.C. Canada is not large, but it is hoped that sales will build up in due course.

Electric and Musical Industries Ltd.

Outlining the reasons for the decline in profit for the year ended Jure 30 last, Sir Alexander Aikman explained that very substantial outlay had been involved in the introduction of long-playing and 45 r.p.m. microgroove records. The radio and television section also met considerable sales resistance, there being a good market for lower-priced models, but not so good for the very high grade types which constitute the bulk of the group's programme, he said. Regarding the foreign subsidiaries, there was as yet no sign of any substantial remittance of dividends from these, although there was still nearly seven months before the end of the financial year.

Marco Refrigerators Ltd.

No dividend is again to be paid by this concern. For the year ended September 3 last, the group profit amounted to £316, as against the previous year's £13,772 loss. The Preference dividend has been paid in full, and the directors state that with economies in operating costs and other measures, the losses which were incurred in the previous year have been stemmed.

Dividends Declared

Associated British Engineering.—Interim of 3% *(same).*

Cape Asbestos Co.—Interim of 5% *(same).*

Rothermel Corporation.—Interim of 10% *(same).*

Telephone Rentals.—Interim of 4% *(same)* on larger capital.

Worthington-Simpson.—Interim of 10% *(same)* but on increased capital.

Commercial Information

CONTRACTS OPEN

HOME

Dates given are the final for receipt of tenders, unless otherwise stated

30 Dec.—Morecambe and Heysham T.C. Installation in 51 houses.—See Dec. 10 issue.

30 Dec.—N. Ireland. Rewiring of Riddel House, Royal Victoria Hospital, Belfast. Documents from Purchasing Officer at that Hospital.

31 Dec.—Burnley T.C. Installation in Heasandford school. Applications by above date.—See Dec. 17 issue.

31 Dec.—Croydon T.C. Flashing beacon equipment.—Advertised in Dec. 17 issue.

31 Dec.—Dublin. Installation at Mount Sackville Convent school.—See Dec. 10 issue.

31 Dec.—Lancashire. Electrical installation at Crosby secondary school and Leigh C. of E. school. County Architect, County Hall, Preston.

31 Dec.—Wembley T.C. Supply of lamps to April 1, 1954.—See Dec. 17 issue.

1 Jan.—Belfast T.C. Equipment required for year ending March 31, 1955.—Advertised in Dec. 3 issue.

1 Jan.—Belfast T.C. (a) Telegraphs and operational telephones, and (b) lighting and heating installation in switchhouse.—Advertised in Dec. 3 issue.

1 Jan.—Wandsworth B.C. Lamps during year from April 1 next—See Dec. 3 issue.

2 Jan.—Evesham R.D.C. Wiring of 8 houses at Rous Lench, 8 at Pebworth, and 4 at Radford. Engineer and Surveyor, Lansdowne, Port St.

2 Jan.—Swansea T.C. Equipment for Technical College.—Advertised in Dec. 10 issue.

4 Jan.—Lancaster T.C. Plant for pumping stations. — See Nov. 4 issue.

4 Jan.—Leyton T.C. Street lighting.—Advertised in Dec. 10 issue.

4 Jan.—Morpeth R.D.C. Wiring installation in agricultural houses at Netherwritten. Engineer and Surveyor, Council Offices, Daore St. Deposit £1 1s.

5 Jan.—Beverley (Yorks) R.D.C. Installation in 10 houses at Beswick.—See Dec. 17 issue.

5 Jan.—Epping U.D.C. Concrete street lighting columns on Beaconfield estate.—See Dec. 17 issue.

6 Jan.—Rowley Regis T.C. Street lighting on Tividale Hall estate.—See Dec. 10 issue.

6 Jan.—Skelton and Brotton U.D.C. Wiring, etc., in 16 houses on Brotton estate.—Advertised in Dec. 17 issue.

6 Jan.—Wandsworth B.C. Supply and erection of street lighting equipment in both Groups A and B. Borough Engineer, Municipal Buildings, S.W.18.—Advertised in this issue.

6 Jan.—Wandsworth B.C. Supply of sodium lamps and jackets. Borough Engineer, Municipal Buildings, S.W.18.—Advertised in this issue.

7 Jan.—Bridgwater (Som.) T.C. Electrical motors, switchgear, etc., at Ashford waterworks.—See Dec. 17 issue.

7 Jan.—Carlow (Eire). Installation at Carlow Mental Hospital.—See Dec. 10 issue.

9 Jan.—Bootle T.C. Lamps, cables and other electrical goods for year from April 1 next.—See Dec. 17 issue.

9 Jan.—Dagenham T.C. Lamps, cables, conduit and accessories for year beginning April 1 next.—See Dec. 3 issue.

9 Jan.—Finsbury B.C. Lamps wanted during year ending Mar. 31, 1955.—See Dec. 10 issue.

9 Jan.—Romford T.C. Lamps included in list of annual supplies.—See Dec. 3 issue.

11 Jan.—Aberdare U.D.C. Lighting equipment at Hirwaun Rd., and Victoria Sq.—Advertised in Dec. 17 issue.

11 Jan.—N. Ireland. Complete installation of electricity at Waveney Hospital, Ballymena. N.I. Hospital Authority's Chief Engineer, Victory Buildings, 44-46 Queen St., Belfast. Deposit £3 3s.

14 Jan.—Co. Down. Complete electrical installation in new school meals centre in Killanghey Rd., Donaghadee. A. V. Irens, consulting engineer, Friends Provident Building, 58 Howard St., Belfast. Deposit £3 3s.

15. Jan.—Lerwick (Scotland). Installation in school at Bell's Brae.—See Dec. 10 issue.

15 Jan.—Sheffield T.C. Electrical installation at Manor Community Centre. J. L. Womersley, City Architect, Town Hall. Deposit £2.

18 Jan.—Market Harborough U.D.C. Overhead lines and underground cable in waterworks extension.—Advertised in Dec. 10 issue.

20 Jan.—Fareham (Hants) U.D.C. Supply of electrical fittings and lamps required during year ending Mar. 31, 1955. Engineer and Surveyor, Westbury Manor, West St.

22 Jan.—Edinburgh T.C. Installation in 32 houses, and five shops at Canongate.—See Dec. 17 issue.

25 Jan.—St. Neots U.D.C. Vertical unchokeable sewage pumps.—See Dec. 17 issue.

27 Jan.—Stamford (Lincs.) T.C. Street lighting.—See Dec. 10 issue.

29 Jan.—Salford T.C. Installation of thermal storage calorifier, electric centrifugal boiler feed pump, etc., at Blackfriars Public Baths. General Superintendent, Administrative Offices, Blackfriars Public Baths.

1 Feb.—N. Cotswold (Glos.) R.D.C. Supply and erection of electrically driven, vertical spindle, centrifugal pumps and auxiliary equipment and other works at Moreton-in-Marsh pumping station. Council's consulting engineers, John H. Haiste and Partners, Norwich Union Chambers, Clarence St., Gloucester. Deposit £1 1s.

3 Feb.—Donegal. Electrical installation in new District Hospital at Dungloe, comprising diesel electric generating plant, switchboard, lighting; wiring for laundry equipment; and supply of cooking equipment. J. C. Costello, consulting engineer, 21 Leeson Park, Dublin. Deposit £10.

No date stated.—Bathgate T.C. Electrical installation in 39 blocks of houses (100 dwellings) on Kirkton and Boghall site. Applications to J. Wright, town clerk.

No date stated—Midlothian. Electrical work in primary school at Pinkie, Musselburgh. —See Dec. 17 issue.

No date stated.—St. Andrews (Fife) T.C. Installation in 58 houses at Auld Barn Park.—See Dec. 17 issue.

No date stated—N. of Scotland H.E. Board. 132 kV switchgear, etc., for Shin substation.—Advertised in Dec. 17 issue.

No date stated.—Stradsett (Norf). Installation of lighting and heating in St. Mary's Church. Details from Parochial Secretary, Old Vicarage, Stradsett, King's Lynn.

OVERSEAS

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Road, W.C.1, quoting reference.*

12 Jan.—U.S.A. Supply of a 4,160 V heavy duty metal-clad switchgear and certain accessories for Army Corps of Engineers, U.S. Army, 628 Pittock Block, Portland 5, Oregon. (Civeng 35-026-54-60). B.o.T. (Ref.: ESB 11904/53)*.

15 Jan.—Portuguese E. Africa Supply of materials for lighting system at Port of Beira, including switchboard, distribution boxes, metal posts, and 6,000 metres of l.t. armoured cable. Railways and Transport Dept., Lourenco Marques. B.o.T. (Ref.: ESB 9248/53)*.

19 Jan.—U.S.A. Dept. of Finance, Seattle, invites tenders (No. 1295) for supply of three 345 kV outdoor oil circuit-breakers. Purchasing Agent, 511 County-City Building, Seattle 4, Washington. B.o.T. (Ref.: ESB 11634/53)*.

20 Jan.—India. Supply of four electrically driven, direct coupled, horizontal spindle sewage pumps; two of 400,000 g.p.h. and two of 600,000 g.p.h. capacity, and all 730 r.p.m. Superintendent of Lighting and Power Plants, Municipal Corpn., Ahmedabad. B.o.T. (Ref.: ESB 11867/53)*.

20 Jan.—India. Tenders (SE-3/25784-D/IV) invited for supply of total of 19,000 yd. of insulated cables to various specifications. Director General, Supplies and Disposals, Shahjahan Rd., New Delhi. B.o.T. (Ref.: ESB 11863/53).*

26 Jan.—Egypt. Supply and erection of 11 kV o.h. transmission lines, switching and transformer substations and connected cable system with transformers, switchgear, cables, cable boxes and accessories. Ref.: 30/Elec. and Gas 3/2/596. Documents from Chief Inspecting Engineer, Egyptian Govt., 41 Tothill St., London S.W.1. Deposit £3 1s. 6d.

27 Jan.—S. Rhodesia. Supply of four 500 kVA and four 300 kVA 3-phase 11,000/400-230 V oil-cooled indoor type distribution transformers, for Municipality of Umtali, Electricity Dept. Ref.: E52/1953. B.o.T. (Ref.: ESB 11893/53)*.

27 Jan.—S. Rhodesia. Supply of 4,000 ft of 0·0225 sq in. 2-core 660 V grade-armoured cable, sector-shaped conductors, and of 3,000 ft of 0·04 sq in. 4-core 660 V grade-armoured cable, sector-shaped conductors, for Electricity Dept., Municipality of Umtali. Contract E.55/1953. B.o.T. (Ref.: ESB 11895/53).*

10 Feb.—New Zealand. Post and Telegraph Dept. invites tenders (P. and T. 150/6677) for supply of some 3,850 lamps and 400 suppressors to various specifications. Director General (Stores Div.), G.P.O., Wellington. B.o.T. (Ref.: ESB 11891/53)*.

16 Mar.—New Zealand. Supply of twelve 3-circuit carrier telephone systems for open-wire lines. Also of 20 portable transmission level measuring sets (decibelmeters); 20 portable variable frequency oscillators; six high-frequency carrier telegraph systems; eight relay and distortion test panels and test oscillator panels for generating telegraph signals; and two separating filter sets. Director-General (Stores Div.), G.P.O., Wellington. Quote P. and T. 150/6670.

CONTRACTS PLACED

Barking T.C. Street lighting along London-Tilbury trunk road, Cohen Bros. (Elect.), Ltd. £2,729.

Ipswich T.C. Supply and installation of equipment for supply of 140 W sodium discharge lamps in Yarmouth Rd. and Chevallier St. Eastern Electricity Board, £1,882.

L.C.C. Supply of lamps during 1954, Siemens Electric Lamps and Supplies, Ltd. (contract renewed).

Luton T.C. Installation of electricity at Rambridge junior school, D. Thomson and Sons (London), Ltd., £2,347.

Swansea T.C. Electrical work at Baths, Lee, Beesley and Co., Ltd.

Your Queries — Answered

"Forfex" clippers, agents for? E.C.—J. A. Fransen Ltd., 6 Ryefield Cres., Northwood Hills. (25308)

"Elec" change-over switches, makers of? C.A.—Engineering and Lighting Equipment Co. Ltd., Sphere Works, St. Albans. (25326)

"Thermac" irons, makers of? E.B.—MacArthur Products Inc., Springfield, Mass., U.S.A. We can find no trace of an agency for this concern. (25347)

"Horstman" clippers, makers of? L.B.—Horstman Ltd., James St. West, Bath. (25362)

"Herga" heating panels, makers of? W.W.—H. G. Poxon Eng. Co., 1/5 Northolt Rd., Harrow, Middx. (25389)

"Elbcol" cooker boiling plates, makers of? T.E.—Electric Boiling Plates Ltd., 25 Shard Rd., S.E.15. (25395)

"Bridgefield" radiator, makers of? B.C.—Bridgefield Eng. Co. (Leeds) Ltd., Fenton Rd., Halifax. (25401)

"Mariol" lantern, agents for? T.E.—E. P. Barrus (Concessionaires) Ltd., 12 Brunel Rd., W.3. (25422)

ANSWER WANTED

"Ingraham" clocks, of American manufacture, firms prepared to undertake repairs? —Y.B. (25428)

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Adelaide Electric Supply Co. Ltd. Meeting will take place at 14 George St., Mansion House, E.C.4, on Jan. 13 at 10.30 a.m. to receive liquidator's report.

Battery Service (Yorks.) Ltd. Resolution for voluntary winding up passed at meeting on Nov. 30 when J. A. Hartley, 10 Clarendon Rd., Leeds was appointed liquidator.

Harvey Briggs (Refrigeration) Ltd. Arthur Tyldesley Eaves, F.C.A., of 47 Mosley St., Manchester, has been appointed liquidator by creditors.

The Kingsman Engineering Co. Ltd., electrical engineers. At first meeting of creditors reported that winding up order was made against company on Nov. 9, based on a petition presented by widow of a former director. Official Receiver said statement of affairs disclosed unsecured liabilities of £381, plus £3 claimed preferentially. Assets expected to produce £595, and it was estimated there would be a surplus as regards creditors of £210, and a deficiency of £789 as regards members. No resolution was passed and matter was left in hands of Official Receiver as liquidator.

BANKRUPTCY ACTS

Public Examination

Oldham. William Heywood, electrical engineer of 15 Miller Rd., Oldham. Public examination will be at Court House, Church Lane, Oldham, on Jan. 28 at 11 a.m. First meeting was on Dec. 18.

Great Grimsby. Brian T. Smith, electrical engineer and contractor, at The Studio, Ramsgate, Louth, Lincs. Date of receiving order, Dec. 7. Public examination will be at Town Hall, Great Grimsby, on Jan. 7, at 11 a.m. First meeting was held yesterday (Wed.).

Dividends

Croydon. Henry C. Francis, electrical engineer trading at 5A Brighton Rd., Redhill. First and final dividends of 12s. 7d. in £ payable at offices of Latham and Co., Walter House, 418-422 Strand, W.C.2, on Jan. 12.

Appointment of Trustee

Bolton. Herbert S. Page, electrical dealer trading at 109 Market St., Westhoughton. Trustee is A. T. Eaves, C.A., 47 Mosley St., Manchester.

PRICE OF CABLE METALS AND OTHER MATERIALS

(Official prices on Monday, Dec. 21)

	£ per ton	Weekly change
COPPER, standard class A (settlement)	231½	+3
" (3 months)	220	+1½
LEAD, refined pig, min. 99·97% purity (cash)	90	—
" (3 months)	88½	—
TIN, refined, min. 99·75% purity (settlement)	650	+10
" (3 months)	627½	+7½
ALUMINIUM, ingots 99·99·5%	150 0 0	—
ZINC, virgin, min. 98% purity (cash) ...	75½	+1½
" (3 months)	74½	+⅜
RUBBER No. 1, RSS. spot (per lb.)	17½d.	−¼
" c.i.f. basis, ports. Feb. (per lb.)	17d.	−¼
ARMOURING:		
Galv. Steel Wire (0·104 in.)	51 10 0	—
Mild Steel Tape (0·014 in.)	40 0 0	—

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London, W.C.2.

Archimedes-Diehl-Machine Co. Ltd. To enter into agreement with Metall-Gub Und Presswork Heinrich Diehl, and act as principals or agents for sale and distribution of electrically operated keyboard calculating machines, etc. Cap.: £5,000. Dirs.: to be appointed by subs. Subs.: C. W. W. Greenidge and I. A. Rose.

Blanella, Ltd., 8 Princes Sq., Harrogate, Yorks. Manufacturers of electric blankets, overlays and pads, etc. Cap.: £1,000. Permnt Dirs.: N. E. North, A. G. Sunderland, and Mary Pickard.

Bertford Manufacturing and Supply Co., Ltd., Marklands Works, Horwich, Lancs. To take over business of electrical factors and merchants at Marklands Works, Horwich, as Bertford Manufacturing and Supply Co. Cap.: £5,000. Dirs.: H. L. Aspinall, 70 Ainsdale Rd., Gt. Lever, Bolton; and A. R. Aspinall, Woodheath, Victoria Rd., Bolton.

Birdell Electrical Co., Ltd. Manufacturers of irons, ironing boards and other commercial and domestic appliances, etc. Cap.: £5,000. Dirs.: not named. Subs.: E. S. Hunt and D. S. Hunt, 1 Leadenhall St., E.C.3.

Excelsior Gauge Co., Ltd. Manufacturers of and dealers in machinery, tools, instruments, gauges and meters and parts thereof, optical goods, jewellery, watches, electrical, radio and radar equipment, etc. Cap.: £100. Dirs.: not named. Subs.: E. A. Clarke, 73 Downing Rd., Upper Norwood, S.E.19; and Sheila Miles, 50 Old Farm Ave., Sidcup.

A. Felix Industries Ltd. Oil fuel engineers, electrical engineers, manufacturers of and dealers in electronics and radar equipment, etc. Cap.: £5,000. Dirs.: A. Felix, W. H. V. Clark, R. M. Ball and B. J. Farrow. Subs.: R. M. Lucas, 3 The Crescent, Watford Rd., N. Wembley; and D. G. Hickels, 34 Church St., Epsom, Surrey.

Gem Radio (Kilburn), Ltd., 17 Shaftesbury Av., W.1. Manufacturers of and dealers in electrical goods of all kinds, etc. Cap.: £100. Dirs.: W. J. R. Pyke and M. Paddle.

E. Harvey (1953), Ltd., 116 St. Helens St., Ipswich, Suffolk. To take over business of electrical, mechanical and diesel engineer carried on at 116/8 St. Helens St., and 1 Regent St., Ipswich, by E. Harvey. Cap.: £5,000. Dir.: E. G. F. Harvey.

Hoddesdon Electrical Co., Ltd. 21 Crossfield Rd., Hoddesdon, Herts. To take over business of electrical engineers and installation and maintenance contractors carried on as "Smith and Hunter of Hoddesdon (Electrical)" at Hoddesdon, Herts. Cap.: £100. Dirs.: F. W. A. Hunter, E. C. Smith, and G. W. Walmsley.

N. G. Loges and Co. Ltd., 27/8 Finsbury Sq., E.C.2. Mechanical, electrical, radio, television and/or general engineers, etc. Cap.: £1,000. Dir.: N. G. Loges.

Minelec Ltd., 38-9 Bruton St., W.1. Manufacturers of and dealers in mineral and chemical substances and materials used in the electrical industry or for electronic purposes, etc. Cap.: £100. Dirs.: B. Richardson and Z. M. Banks.

BUSINESS PROSPECTS

HOME

Birkenhead. Application to be made to borrow £107,749 for erection of St. Winefred's R.C. secondary school for girls at Oxton.

Blyth T.C. Consideration being given to erection of 50 houses at Seaton Sluice.

Bootle T.C. Construction of three-storey block of shops and maisonnettes on Copy Lane estate. Borough Surveyor, Town Hall.

Boscombe (Hants.). Quantity surveyor for erection of laboratory at Royal Victoria Hospital will probably be P. S. Rathbone, 85 Holdenhurst Ave., Southbourne.

Bournemouth. Scheme approved for first part of extensions to Municipal College. Estimated cost, £195,000.

Bradford T.C. Erection of fire station in Highfield Rd., Idle. City Architect, Town Hall.

Bristol. Land to be leased to Llewellins and James, Ltd., for erection of new premises, and to Coca-Cola Southern Bottlers, Ltd., for same purpose.

Cardiff T.C. Erection of shops and maisonnettes in three contracts at North Llanishen, Llanrumney and Fairwater. City Surveyor's Office, City Hall.

Chelmsford T.C. Revised plans approved for erection of church in Pentland Ave. Architect is B. J. Briggs, Old Town Hall, Gt. Dunmow, Essex.

Chichester T.C. Plans being considered for factory extension on industrial estate, Terminus Rd., for Beanstalk Shelving, Ltd. Also factory for Auto Body Repairs, Ltd., and bus garage for Southdown Motor Services, Ltd.

Cornwall. It is proposed to build secondary modern school at Trescobeas at estimated cost of £184,000.

Crawley (Sussex). Approval in principle given to erection of police station and health clinic at New Town. It is proposed also to build new technical college; estimated cost of first stage is £179,000.

Daventry. Kneller Precision Instrument and Tools, Ltd., of Rugby, to erect factory on site at Checkley Field.

Dublin T.C. Erection of 202 houses, 10 shops and estate office at Ballyfermot. Housing Architect, 6 Mountjoy Sq.

Enfield. Factory to be built in Great Cambridge Rd. by Chamberlain Industries, Ltd.

Esher U.D.C. Scheme approved for erection of 38 houses and 6 bungalows on Canada Rd. estate.

Farnborough (Hants.). Scheme in hand for erection of fire station in Reading Rd. at estimated cost of £11,200.

Gateshead. Site at Lobley Hill has been allocated for erection of R.C. church.

Gateshead T.C. Negotiations in hand for purchase of land at Saltmeadows for erection of 200 houses or multi-storey flats.

Glasgow T.C. Construction of 71 flats at Garthanlock. Architectural and Planning Dept., 20 Trongate.

Gloucestershire. Erection of school at Cadbury, Heath Warmley. County Architect, Shire Hall, Gloucester.

Greenock. J. Walker and Co. (Sugar Refiners), Ltd., propose to extend premises in Princes St. at cost of about £300,000.

Greenwich. Approval sought for erection of maternity and child welfare clinic in Burney St. Cost estimated at £13,820.

Guildford. Factory proposed for Keefe and Lewis, Ltd. Architects are Clyde, Young and B. Engle, 8 New Sq., Lincoln's Inn, W.C.1.

Hastings. Plans submitted for factory in Theaklen Drive for Sutty Motor Accessories, Ltd.

Havant (Hants.). Erection of fire station in Park Way is proposed.

Ilford T.C. Approval sought for supply and installation of immersion heaters in council houses. Scheme estimated to cost £9,535.

Kilkenny (Eire). Erection of orthopaedic hospital at Kilcreene. A. F. Reddy, Quantity Surveyor, 23 Ely Pl., Dublin.

Kirkcaldy T.C. Construction of 10 shops and 10 maisonnettes at Temple Hall, 16 houses off Adamson Avenue, and 8 houses off Chestnut Avenue. Borough Engineer and Surveyor, Town House.

Lambeth. Scheme in hand for erection of extensions to Norwood Technical College, estimated to cost £81,116.

Llandovery T.C. Erection of 20 houses on Caefelincaean site. Borough Surveyor's Office, Assembly Rooms.

Melton and Belvoir (Leic.) R.D.C. Total of 186 houses to be built in area during 1954.

Newcastle-on-Tyne T.C. Layout approved for Kenton North estate which includes 413 houses.

Northampton T.C. Erection of Cherry Orchard secondary school. H. A. Skerrett, Chief Education Officer, "Springfield," Cliftonville, Northampton.

Pembrokeshire. Construction of Technical Inst. at Neyland. County Architect, County Offices, Haverfordwest.

Reading T.C. Revised scheme being considered for erection of St. Michael's primary school. Estimated cost, £48,114. Also erection of 5 shops and 10 flats in Southcote Farm Lane. Borough Architect, Town Hall.

Rugby T.C. Approval sought for erection of six shops with maisonnettes in Bilton Rd. Tenders to be invited shortly.

Samford (Suff.) R.D.C. Approval given for erection next year of 15 dwellings each at Sutton and Stratford St. Mary, 12 at Harkstead and 4 at Shotley.

Scarborough T.C. Twenty old persons' flats to be built at Barrowcliffe. 1954 allocation of houses is 200.

Slough (Bucks.). Fire station proposed at junction of Tuns Lane and Bath Road.

Southend-on-Sea T.C. Erection of an inquiry bureau. Borough Architect, 30 Alexander Street.

Spennymoor (Dur.). S. E. Dykes-Bower, Quendon Court, Quendon, Essex, to prepare scheme for restoration of St. Paul's Church.

Stepney B.C. Scheme proposed for Barchester St. site provides for 84 flats in two 11-storey blocks, 232 maisonnettes, four shops, etc. Estimated cost £750,260.

Tunbridge Wells T.C. Erection of 22 houses and 8 flats on Sherwood estate.

Wakefield T.C. Layout approved for 106 houses and 36 flats to complete development of No. 2 area on Kettlethorpe estate.

Wallsend. R. Burke, Lambton House, Lambton Rd., Jesmond, is architect for proposed new infant school. Also, W. Stockdale, 73 Howard St., North Shields, has been appointed architect for engineering labora-

tory and offices in Stephenson St., for Commercial Plastics, Ltd.

Walsall T.C. Approval given for erection of R.C. secondary school in Dartmouth Ave. Estimated cost £200,000.

Winchester. Application to be made to borrow £536,366 for new county offices near Westgate. Architect is C. Cowles-Voysey, 2 Bunkers Hill, London N.W.11.

Windsor R.D.C. Fifty-eight houses to be built at S. Ascot and 26 in Old Windsor.

OVERSEAS

British East Africa. Building expected to start early next year on new £300,000 hospital in Limurn Rd., Nairobi, for Ismailia community. Interested persons are advised to contact Sir Eboo Pirbhai, P.O. Box 898, Nairobi.

Mexico. Equipos Superiores, S.A., of Bucareli 109 Mexico 6, D.F., wish to import and possibly have sole representation of line of small British generators. Those required are from 500 W to 10 kW output at 125 V, single phase, a.c.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Cafetomaton. 723,349 and **Jacomatic,** 723,350. All goods in Class 11. Jackson Boilers Ltd., Vulcan Works, Shafton Lane, Leeds 11.

Chernett. 722,852. Class 9. Electrical apparatus and instruments. G. L. A. Cherrington, rear of 51 Jenkins St., Birmingham 10.

Dathene. 723,387. Class 9. Cables and wires. J. Day and Co. (Derby Works) Ltd., Harrow Manor Way, Abbey Wood, S.E.2.

Gardsman. 722,394. Class 9. Automatic temperature controlling instruments, etc. Ether Ltd., Tyburn Rd., Erdington, Birmingham 24.

Gilflex. 718,936. Class 9. Conduits made from flexible non-metallic tubing. Gilflex Conduits, Ltd., 41 The Parade, High St., Watford.

Heddo 721,575 and **Heddoplast** 721,574. Class 17. Insulating material made of p.v.c. Heddon-Smith (Overseas), Ltd., 374 Euston Rd., N.W.1.

Lifeline. 722,771. Class 9. Radio apparatus. W.N.A., Ltd., 81 Chester Sq., S.W.1.

TRADE NOTES

Beama Contract Price Adjustment Formulae.—*For Electrical Machinery and Equipment.* For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at December 12, 1953, shall be deemed to be 141s. 6d.; (*b*) "Cost of Material"—the index figure for materials used in the Electrical Machinery Industry published in the Board of Trade Journal on December 12, 1953, is 157·0.

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at December 12, 1953, shall be deemed to be 141s. 6d.; (*b*) "Cost of Material"—the index figures published in the Board of Trade Journal on December 12, 1953, are: Materials used in Mechanical Engineering Industries—147·3; "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—144·1. The price of brass condenser tubes, ¾in. o/d, 18 s.w.g. published in *The Metal Bulletin* on December 11, 1953, is 3s. 5¼d. per lb.

For outstanding Contracts covered by the B.O.T. Intermediate Products Index. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at December 12, 1953, shall be deemed to be 141s. 6d.; (*b*) "Cost of Material"—the index figure for Intermediate Products published in the Board of Trade Journal on December 12, 1953, is 353·8.

New Branch Office. The Middlesbrough office of the British Thomson-Houston Co., Ltd., is now at Prudential Chambers, 27 Albert Rd. The telephone number remains 2476.

New Year Holiday. The Edinburgh works of Bruce Peebles and Co., Ltd., will be closed from December 31 until Wednesday morning, January 6.

Change of Address. Early in the New Year Dawe Instruments, Ltd., will be moving to more extensive premises at 99 Uxbridge Rd., Ealing, London W.5.

MEETINGS TO NOTE

FRIDAY, JAN. 1

I.E.S. (Bath and Bristol).—"Stage Lighting including Latest Developments." L. G. Applebee. At Bristol, 6.15 p.m.

SATURDAY, JAN. 2

BIRMINGHAM ELECTRIC CLUB. Tenth annual children's party at Grand Hotel, 3 p.m.

MONDAY, JAN. 4

N. EASTERN ELECTRIC CLUB. "X-rays in the Medical World." A. J. Wright.

I.E.E. (Mersey and N. Wales).—"Electronic Telephone Exchanges." T. H. Flowers. Liverpool Royal Instn., Colquitt St., 6.30 p.m.

I.E.E. (S. Midland).—Discussion on "Tech. Education of Non-National Certificate Students." J. Ashmore and D. I. Meyrick. James Watt Memorial Inst., Great Charles St., Birmingham, 6 p.m.

I.E.E. (Ipswich).—"Modern Developments in Atomic Energy." T. E. Allibone. Crown and Anchor Hotel, 6.30 p.m.

I.E.E. (Maidstone).—"Education for Electrical Industry." H. E. Etherington and L. J. N. Kirkby. Sun Hotel, Chatham, 7.30 p.m.

TUESDAY, JAN. 5

INCORP. PLANT ENGRS. (London).—"Transmission Equipment and Bearings." F. J. Walters. Royal Soc. of Arts, W.C.2, 7 p.m.

INCORP. PLANT ENGRS. (Edinburgh).—"Power Factor Correction." H. Ferguson. 25 Charlotte Sq., 7 p.m.

I.E.E. (London Measurements).—"Scaling Unit employing Multi-Electrode Cold-Cathode Tubes," and "Sensitive Pulse Trigger Circuit with Stable Threshold," K. Kandiah. Also "Development of Neutron Spectrometer for Intermediate Energies." F. S. Goulding, J. C. Hammerton, M. G. Kelliher, A. W. Merrison, and E. R. Wiblin. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Midland).—"Voltage Transformers and Current Transformers associated with Switchgear." W. Gray and A. Wright. Elect. Offices, 1 Whitehall Rd., Leeds, 6.30 p.m.

I.E.E. (N. Western).—"Co-ordination of Insulation of High-Voltage Electrical Installations." J. S. Cliff. Engineers' Club, Albert Sq., Manchester, 6.15 p.m.

WEDNESDAY, JAN. 6

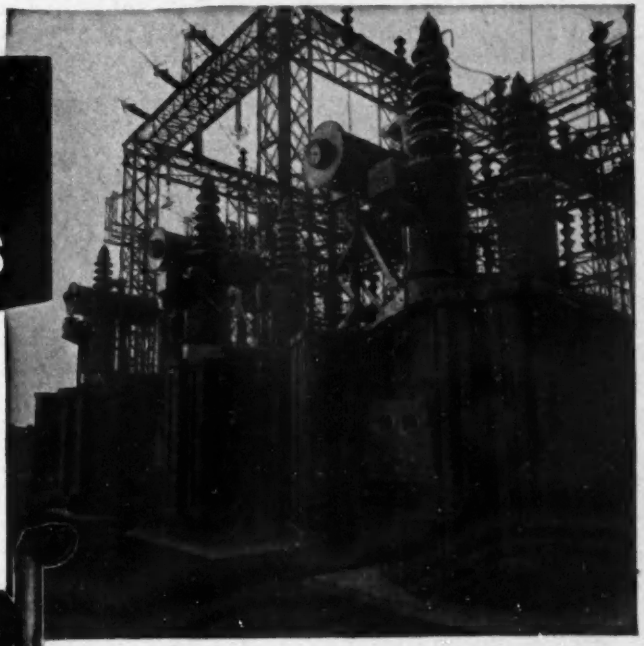
I.E.E. (N.W. Radio).—"Simple Connection between Closed-Loop Transient Response and Open-Loop Frequency Response." J. C. West and J. Potts. Engineers' Club, Albert Sq., Manchester, 6.30 p.m.

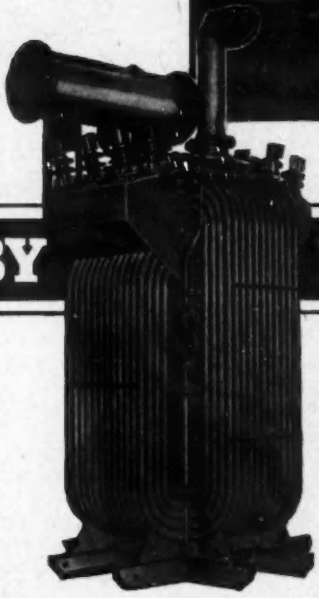
I.E.E. (Southern).—"Operation of Power Transformers." E. T. Norris. Elect. Board H.Q., Hove, 6.30 p.m.

EXHIBITION DIARY

Hotel, Restaurant and Catering.—Fourth exhibition to be held at Olympia, London, from Jan. 20 to 29

CURRENT LIMITING REACTORS





BY HACKBRIDGE

Whether magnetically or copper shielded, Hackbridge reactors embody the Hackbridge principle of unit construction: in either type the whole assembly constitutes a rigid structure of exceptional mechanical strength to withstand the largest electro-mechanical stresses met with under service conditions. Send for publication DB.18/1.

The illustrations show typical Hackbridge magnetically shielded reactors. Above: at Coventry Generating Station for introducing 18% reactance into the 90 MVA 132 kV. system; and below, for introducing a 3.75% reactance into a 30 MVA 6.6 kV. system.

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES · SURREY · ENGLAND
Telephone: Walton-on-Thames 760 (8 lines) *Telegrams: "Electric, Walton-on-Thames"*

CONDUIT & FITTINGS SUPPLIED BY

METALLIC

Oswin Mills, Frizinghall, Bradford.
Photo by courtesy of Samuel Rushworth, Ltd.

Electrical Contractors for this important installation:
A. R. Farrar & Co. Ltd.

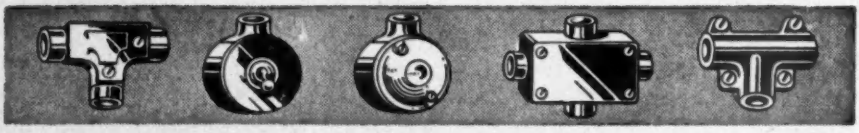
A TI COMPANY

It may be a school, it may be a factory—a power station or a housing estate, but more often than not the electrical specification will be—METALLIC.

This Yorkshire mill is no exception, being fitted throughout with METALLIC conduit and fittings—unequalled for quality and consistent accuracy.

THE METALLIC SEAMLESS TUBE CO. LTD.

LUDGATE HILL • BIRMINGHAM • 3



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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

METROPOLITAN BOROUGH OF WANDSWORTH

SODIUM LAMPS

TENDERS are invited for the supply of sodium LAMPS and JACKETS.

Tender forms, etc., which are obtainable from the Borough Engineer at the under-mentioned address, must be returned to me by noon, January 6, 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (G 223)

EGYPTIAN GOVERNMENT

TENDERS are called for by the Director General, Cairo Electricity and Gas Administration, for the SUPPLY, DELIVERY and ERECTION of 11 kV overhead TRANSMISSION LINES, switching and transformer SUBSTATIONS and the associated connecting CABLE SYSTEM complete with TRANSFORMERS, SWITCHGEAR equipment, CABLES, CABLE BOXES and ACCESSORIES and buildings.

Tenders should be submitted to:—

The Director General,
Cairo Electricity and Gas Administration,
53 Fouad El Awal Street,
Cairo, Egypt

not later than 12 o'clock on January 26, 1954.

Copies of the necessary conditions of tender, specification, etc., can be obtained on application to the Chief Inspecting Engineer, Egyptian Government, 41 Tothill Street, London S.W.1, against remittance of £3 1s. 6d. per set, which sum must be prepaid and is not returnable. Copies of these documents are also available for scrutiny at the above address. Cheques must be endorsed permitting transfer to an Egyptian Government Account.

Reference No. 30/Elec. & Gas 3/2/596 must be quoted in all correspondence. (G 220)

METROPOLITAN BOROUGH OF WANDSWORTH

(i) SUPPLY OF STREET LIGHT EQUIPMENT
(ii) ERECTION OF STREET LIGHTING EQUIPMENT

TENDERS are invited for the two above-mentioned contracts for Group A and B street lighting. Tender forms, etc., which are obtainable from the Borough Engineer, must be returned to me by noon, Wednesday, January 6, 1954.

R. H. JERMAN,
Town Clerk.

Municipal Buildings,
Wandsworth, S.W.18. (G 197)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59, unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS invited for JUNIOR ENGINEER on distribution work in North Caledonia area. Salary, £402/£486, N.J.B. Class "F," Grade 15/14, according to experience. Superannuation scheme applicable. Applications, stating age, qualifications and experience, to be forwarded to Area Manager, West Villa, Elgin, Morayshire, by December 30. (G 224)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Lanarkshire Sub-Area

APPOINTMENT OF
THIRD ASSISTANT DISTRICT ENGINEER
Coatbridge District

APPLICATIONS are invited for the above appointment.

Applicants should preferably be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound engineering training with subsequent experience in the operation and maintenance of h.v. and l.v. switchgear and overhead and underground distribution systems.

The salary and conditions of service will be in accordance with the National Joint Board Agreement. Schedule "A." The present classification and grading is "F.9," salary £907 to £929 per annum, which will be subject to the statutory deductions including superannuation. The successful candidate will require to reside within a reasonable distance of the Coatbridge District Offices.

Application forms, which may be obtained from the undersigned or any other Sub-Area Manager, should be returned to this office within 14 days of the appearance of this advertisement.

DUGALD SMITH,
Manager.

137 Almada Street,
Hamilton.
December 24, 1953. (G 226)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Cowal Area

(Loch Lomondside, Dunoon, Rothesay, Cumbraes and Arran).

COMPETENT DEMONSTRATOR required for the Cowal Area. Applicants should hold the E.A.W. certificate, or equivalent, and include experience in electrical housecraft, organising and conducting cooking and other demonstrations, consumer service calls, etc.

Salary N.J.C. Grade 1 (£380-£470 per annum). Superannuation scheme.

Application forms, which can be obtained from the Area Manager, Hamilton Street, Dunoon, should be completed and returned to arrive not later than Monday, January 4, 1954. (G 225)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Electrical) is required at Ocker Hill Generating Station, Tipton, Staffs. N.J.B. service conditions; superannuable appointment; salary within Schedule "A," Grade "F.9," of the Agreement, commencing at £635 per annum.

A thorough technical training is required and practical experience in power station electrical maintenance. Appropriate technical qualifications an advantage.

Apply on Form A.E.6, quoting Vacancy No. 567 M.D., to the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by January 11, 1954. (G 227)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the post of FITTER at Earley Generating Station. Applicants should be skilled fitters, and experience with high-pressure turbines and their auxiliaries, would be an advantage. Rate of pay 3s. 8d. per hour, for a 44-hour 5-day week.

Applications to be submitted to the Station Superintendent, Earley Generating Station, Shepherds House Lane, Earley, near Reading, on or before December 31, 1953. (G 215)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

Littlebrook Power Station (Class M—480 MW)
SHIFT CHARGE ENGINEER

APPLICANTS should preferably hold an engineering degree or be Corporate Members of the Institution of Electrical Engineers and/or Institution of Mechanical Engineers, and have had extensive experience in the operation of modern high-pressure turbine and boiler plant and e.h.t. switchgear. Considerable experience in administration and in the control of labour essential. Preference will be given to those with p.f. experience. Assistance with housing accommodation may be possible for those at present living in rented property. Grade 7, £1,035 6s. per annum.

ASSISTANT ENGINEERS
(OPERATION AND EFFICIENCY)

(1) Grade 5, £1,189 per annum. Applicants should preferably possess an engineering degree or be Corporate Members of either the Institution of Mechanical or Electrical Engineers. The successful applicant will be responsible to the Station Superintendent for the efficient operation, technical investigations and plant testing of the power station plant.

(2) Grade 8, £968 2s. per annum. Applicants who should preferably possess an engineering degree or similar qualification will be required to assist the Station Operation and Efficiency Engineer in the examination of station performances and the determination of station operation and maintenance policy, and will be responsible for the control of staff dealing with the day-to-day work relating to station efficiency.

N.J.B. conditions of service. Salaries quoted include London Allowance.

Applications giving details of education, present position, experience, etc., should be received by the Station Superintendent, Littlebrook Generating Station, nr. Dartford, Kent, not later than January 2, 1954.

(G 214)

LONDON ELECTRICITY BOARD

TRAINING CENTRE SUPERVISOR

APPLICATIONS are invited for the above position at the Board's Training Centre in City, E.C.4. This Centre will provide mainly basic workshop training for apprentices but there will also be facilities for other types of training courses.

The Supervisor will work closely with the Education and Training Officer regarding the recruitment, selection and reporting of apprentices. He will be required to give instruction, to lecture and to be responsible for the general organisation of the Centre, including the supervision of the Apprentice Instructors and the creation of appropriate training syllabuses. Candidates should have had a sound engineering training, should be proficient in the use of hand and machine tools and should have had experience of instructing in the basic workshop skills. Previous work of this nature in a Technical College would be an advantage.

The post is graded under Schedule "C" of the National Joint Board Agreement as Class "AX/DX," Grade 5, Third Assistant Engineer, and the salary range will be from £740 6s. per annum to £900 18s. per annum, inclusive of London Allowance. The commencing salary within the range will be in accordance with qualifications and experience.

Application forms from Secretary, 46 New Broad Street, E.C.2, to be returned completed within 14 days of the publication of this vacancy. Please enclose addressed envelope and quote Ref. V/1694/T. (G 203)

SOUTH WEST SCOTLAND ELECTRICITY BOARD

APPOINTMENT OF
SECOND ASSISTANT DISTRICT ENGINEER
Ardrossan District.

APPLICATIONS are invited for the position of Second Assistant District Engineer in the Ardrossan District of the above Sub-Area.

Applicants should be Graduates of the Institution of Electrical Engineers or hold equivalent technical qualifications. Experience in the operation, maintenance and construction on h.v. and l.v. overhead and underground distribution systems and sub-stations essential.

Salary and conditions in accordance with the National Joint Board Agreement, Schedule "A," Grade 7, Class "E," £649 to £681 per annum subject to statutory deductions including income tax and superannuation.

The successful candidate will be required to reside in a house provided by the Board in the Burgh of Largs, about 12 miles from the District Office, Ardrossan.

Forms of application may be obtained from the undersigned and should be returned to me duly completed with any additional information not later than January 4, 1954.

A. E. ROOTS,
Manager.

Greenholm Street,
Kilmarnock.
December 15, 1953. (G 212)

HER MAJESTY'S COLONIAL SERVICE

GENERATION ENGINEER
Nyasaland.

DUTIES include maintenance and operation of steam power and diesel plant. Commencing pay (inclusive of allowances) £1,458 in a scale rising to £1,710 per annum to suitably qualified and experienced candidate.

Appointment will be on three years' probation for pensionable employment. Free passages, once each way each tour, to officer, his wife and children up to the cost of one adult passage. Quarters, if available, are provided at low rent and leave is granted at the rate of 5 days for each month of service after a tour of two to three years.

Candidates, not over 40 years of age, should be Corporate Members of one or more of the recognised Engineering Institutions and should be familiar with the operation and maintenance of modern medium pressure steam power plant.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith Street, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number CDE.145/4/01. (G 198)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the appointments of (a) SENIOR DRAUGHTSMAN, and (b) ENGINEERING DRAUGHTSMAN, in the Mechanical Engineering Section of the Generation Construction Department at Wolverhampton. N.J.B. service conditions, superannuable appointments, salaries within Schedule "D" of the Agreement: (a) Grade 4, £671 to £780; and (b) £433 to £567 per annum.

A sound technical education and practical training are required, and experience in the drawing office of a large manufacturer's works engaged on turbine, boiler plant, or general engineering construction. Appropriate technical qualifications an advantage.

Apply on Form A.E.6 quoting Vacancy No. (a) 565 MD., and (b) 566 MD, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by January 16, 1954. (G 228)

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
Dorking and Epsom District

SALARY £699 to £725 per annum under N.J.B., Class "E," Grade 6. Superannuable. Applicants should be suitably qualified and experienced in all aspects of a commercial department, including contracting. A good knowledge of rural electrification, negotiations for extensions of mains and experience in the application of electricity to farms is essential.

Applications, on forms obtainable from W. B. Hayden, M.I.E.E., Dorking and Epsom Manager, SEEBoard, 56 South Street, Dorking, and giving two referees, must be returned to him by January 6, 1954.

A. L. BURNELL,
Secretary.
(G 217)

BRITISH ELECTRICITY AUTHORITY

South East Scotland Division

GENERAL ASSISTANT ENGINEER (Telecommunications) required in the Technical Department at Divisional Headquarters, Portobello.

Applicants should possess H.N.C. or equivalent and have experience in installation and maintenance of automatic telephone equipment employing both d.c. and v.f. signalling. Some knowledge of carrier frequency equipment and v.h.f. radio would be an advantage.

Salary scale £501 to £656 per annum (N.J.B. Class "AX/BX" 8). Placing according to experience. Pension scheme.

Apply, in writing, by January 8, 1954, to Divisional Controller, British Electricity Authority, South East Scotland Division, British Electricity House, High Street, Portobello, Midlothian. (G 202)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR ASSISTANT (COMMERCIAL DEPARTMENT) required at Board Headquarters, Love Lane, Liverpool 3, at a salary in accordance with N.J.C. Grade 5 (£640/£700).

Candidates should have a knowledge of appliance sales promotion, displays and exhibitions, and the preparation of lecture notes and general publicity on the use of Electricity.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Establishments Officer at the above address should be returned by January 11, 1954. (G 221)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division.

CIVIL ENGINEERING DRAUGHTSMEN
Construction Department. Vacancy No. 22/53.

Candidates should have had experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 5 (£567-£671 per annum) or Grade 6 (£433-£567 per annum) of Schedule D of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN (MECHANICAL)
Construction Department. Vacancy No. 44/53.

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:—

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.

(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.

(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Salary and conditions of service will be in accordance with the National Joint Board Agreement, Grade 5 (£567-£671 per annum) and Grade 6 (£433-£567 per annum) of Schedule D according to experience.

ENGINEERING DRAUGHTSMEN (ELECTRICAL)
Construction Department. Vacancy No. 61/53.

Candidates should have experience in the preparation of layouts and diagrams for the installation of E.H.T. and L.T. switchgear, transformers, E.H.T. and L.T. cables; knowledge of protective gear systems would be an advantage.

The salary will be in accordance with Grade 5 (£567-£671 per annum) or Grade 6 (£433-£567 per annum) of Schedule D of the National Joint Board Agreement.

ASSISTANT SHIFT CHARGE ENGINEER
Avon Power Station. Vacancy No. 147/53.

Applicants should have had sound technical training and experience with modern generating plant and should preferably have the Higher National Certificate in Electrical and Mechanical Engineering.

The salary for this appointment will be in accordance with Class "E," Grade 9 (£587-£600 per annum) of the National Joint Board Agreement.

The closing date for this appointment will be January 4, 1954.

JUNIOR CHEMIST
Staythorpe Power Station. Vacancy No. 148/53.

Applicants must have had a sound technical training and some laboratory experience is desirable.

Preference will be given to candidates who hold the Higher National Certificate in Chemistry, but holders of the Ordinary National Certificate in Chemistry will be considered.

The salary will be in accordance with the National Joint Board Schedule within the salary range £402-£545 per annum.

The closing date for this appointment is January 4, 1954.

MECHANICAL MAINTENANCE ENGINEER
Drakelow Power Station. Vacancy No. 149/53.

Applications from suitably qualified engineers are invited for the above position; candidates should have good administrative and organising ability, and have experience in all aspects of the maintenance of large capacity high-pressure turbo-alternators and pulverised fuel fired boilers.

Apprenticeship at a large manufacturing works will be an advantage.

Salary Class "J," Grade 6, £863-£918 per annum under the National Joint Board conditions of service.

The closing date for this appointment is January 4, 1954.

FIRST ASSISTANT CHEMIST
Burton-on-Trent Power Station. Vacancy No. 150/53.

Applicants should preferably possess the Higher National Certificate in Chemistry or its equivalent. They should have had practical experience in the analysis of coal, water and oil, etc., in so far as they concern power station requirements and will be directly responsible to the Group Chemist.

The salary for the above appointment will be as National Joint Board Schedule, Class "E," Grade 9, £587-£600 per annum.

The closing date for this appointment will be January 4, 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the dates stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller. (G 222)

ELECTRICITY SUPPLY BOARD, IRELAND

VACANCIES FOR INSTRUMENT MECHANICS

THE ELECTRICITY SUPPLY BOARD has vacancies on its staff for the following:—

(a) INSTRUMENT MECHANIC, North Wall Generating Station, Dublin;

(b) INSTRUMENT MECHANIC, Cork Generating Station.

Applicants must have had experience on the operation, maintenance and testing of:—

(i) Instruments used in connection with water, oil and steam measurements (electrically and mechanically operated).

(ii) Instruments used on the control of temperature and of carbon dioxide.

(iii) Automatic boiler control equipment.

Applicants must indicate clearly the nature and length of their experience under each of the foregoing headings.

The rates of pay applicable to the positions are as follows:—

North Wall: 3s. 11d. per hour to 4s. 3d. per hour for a 44-hour week.

Cork: 3s. 11d. per hour to 4s. per hour for a 48-hour week.

Selected applicants may, having regard to their experience and qualifications, be appointed at a rate in excess of the minimum.

Applications, giving age, education and details of technical qualifications and experience and indicating for which position the applicant wishes to be considered, should be addressed to the Board's Personnel Officer, 27 Lower Fitzwilliam Street, Dublin, and reach him not later than Saturday, January 2, 1954.

PATRICK J. DEMPSEY,
Secretary.
(G 200)

EASTERN ELECTRICITY BOARD

Chief Commercial Officer's Department.
ASSISTANT (84/53.R)

APPLICATIONS are invited for the appointment of an Assistant in the Chief Commercial Officer's Department at Wherstead.

Applicants should by training and experience be thoroughly acquainted with general commercial practice and able to analyse statistical data, and should have had experience of office routine, supervision of filing, preparation of minutes and records of meetings (for which a knowledge of shorthand would be an advantage).

The salary for this appointment will be in accordance with Grade 6 (£700 by £25 to £775) of the National Joint Council Salary Agreement. Future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Chief Commercial Officer, Eastern Electricity Board, Wherstead, Ipswich, Suffolk, within 14 days of the appearance of this advertisement. (G 213)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF ELECTRICIAN—(TELEPHONE)
Chief Engineer's Department, Area Board Headquarters, Manchester 8

APPLICANTS should be experienced in automatic telephone exchange maintenance. Knowledge of v.h.f. radio and ability to repair and maintain telecommunication apparatus would be an advantage.

The person appointed will normally be located at the Board's Testing Station, Tully Street, Salford, but will be required to assist in the maintenance of equipment in other districts.

Rate of pay, 44d. per hour for a 44-hour, five-day week. N.J.I.C. conditions.

Applications to Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, by January 2, 1954. (G 201)

SOUTH EASTERN ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER
Mid-Sussex Sub-Area Headquarters.

SALARY £1,026 to £1,071 in accordance with Class "J," Grade 4 of the N.J.B. Agreement. Superannuable. Applicants should be Corporate Members of the I.E.E. and should have had a sound training in distribution engineering, followed by experience in the construction, operation and maintenance of overhead and underground systems up to 33 kV.

Applications giving names of two referees should reach H. Pryce-Jones, J.P., M.Eng., M.I.C.E., M.I.E.E., Mid-Sussex Manager, SEEBoard, Mid-Sussex House, North Road, Brighton 1, by Monday, January 4, 1954.

A. L. BURNELL,
Secretary.
(G 204)

CENTRAL ELECTRICITY BOARD
Federation of Malaya

ASSISTANT POWER STATION SUPERINTENDENT (M2C/28789/EE) and MECHANICAL ENGINEER (M2C/30085/EE) required by the above board. Option of appointment either (a) on agreement for three years with prospect of permanency, or (b) on contract for three years with gratuity of £200 or £280 for each year's service, according to salary. Allowances additional to those mentioned below and ranging between £210 and £630 a year payable to married men according to salary. Opportunity of terminating appointment at end of one year if so desired.

Assistant Power Station Superintendent. Salary, etc., according to qualifications and experience in scale equivalent to £1,904, rising to £2,100 a year. Candidates must have wide experience of station maintenance and operation and preferably have held a similar position in a steam power station of not less than 80 MW capacity or as a charge engineer for at least five years in a station of not less than 120 MW capacity.

Mechanical Engineer. Salary, etc., according to qualifications and experience in scale equivalent to £1,197, rising to £2,100 a year. Candidates must have had a good general education and should preferably be Corporate Members or Graduates of the Institution of Mechanical Engineers or possess equivalent qualifications. They must also have had sound technical and practical training in mechanical engineering with subsequent experience in the operation and maintenance of diesel engines. Experience in an electricity supply undertaking or a knowledge of 3 phase a.c. generation would be a distinct advantage.

Write to the Crown Agents, 4 Millbank, London S.W.1, state age, name in block letters, full qualifications and experience and quote reference number against the post for which application is made. (G 216)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT (TECHNICAL) required, to be based on Mold in the Board's No. 4/5 Sub-Area. Salary £524 to £540 per annum, N.J.B. E/11.

Applicants should have an engineering training, experience in dealing with electrical wiring, appliances and consumers' supply enquiries. Ability to speak Welsh would be an advantage.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date January 6, 1954. (G 199)

DRAUGHTSMAN required with experience in electrical installation work. Applicants should give details of age, previous experience and salary required. —Reply to Mr. Oscar C. Waygood, Consulting Engineer, Lewis's, Ltd., Ranelagh Street, Liverpool 1. (G 205)

ELECTRICAL ENGINEER, age not over 30, preferably with degree, required at factory in West Midlands, for testing and development work in connection with high-voltage porcelain insulators. Applicants should have some industrial experience in connection with the manufacture or testing of high-voltage equipment. The maximum salary for this post is £1,100 per annum and the starting salary will be calculated according to the qualifications and experience of the successful applicant. —Box No. 3155, Electrical Times. (G 213)

ELECTRICAL ENGINEER required for electrical department of works in the north-east. Should have a sound practical training, drawing office experience, a knowledge of motor control gear resistance calculations, and preferably some experience of electrical heating for industrial applications.—Apply, giving full details of experience, technical qualifications, age, whether married or single and salary required to Box No. 3139, Electrical Times. (G 157)

FERGUSON RADIO CORPORATION, LTD., offers exceptional opportunities to DRAUGHTSMEN wishing to make their career in the world of electronics, television and radio. Candidates preferably experienced in the radio and television industries, must have knowledge of mass production methods and workshop practice. Familiarity with Ministry requirements an advantage. Good salaries, pension scheme. Well-equipped drawing offices and good working conditions.—Apply: Employment Manager, Ferguson Radio Corporation, Ltd., Great Cambridge Road, Enfield, Middx. (G 131)

PIRELLI-GENERAL CABLE WORKS, LTD., have Sales Department STAFF VACANCIES for general correspondence and preparation of Mains Cable Tenders.—Apply in writing to Sales Manager, Eastleigh Works. (G 115)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59, unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

HANDLEY PAGE (READING) LTD., The Aerodrome, Woodley, Reading, have an immediate vacancy for a SENIOR AIRCRAFT ELECTRICAL DRAUGHTSMAN for work on an interesting new project. Only those who are fully experienced in all aspects of the work should apply, and for the successful applicant there will be suitable housing accommodation provided.—Please send full particulars of experience, etc., to the Personnel Officer. (G 28)

SALES ENGINEERS required by progressive firm of electrical manufacturers for instrument sales in London and Manchester areas. Applicants should have knowledge of wide variety of electrical instruments and of commercial practices. Outside sales experience desirable but men otherwise qualified will be given training. General salary and full expenses paid. Pension scheme. —Reply to Box No. 3147, Electrical Times. (G 189)

SALES REPRESENTATIVES required for the following areas: Scotland, Newcastle, Manchester, Midlands, south and south-west England, to promote the sale of Prestcold domestic refrigerators through electricity boards and dealer organisation. Salary, commission and expenses. Pension scheme and other facilities available. —Apply in writing to the Domestic Sales Manager, Refrigeration Division, Pressed Steel Co., Ltd., Cowley, Oxford. (G 206)

SAN SALVADOR (Central America). ASSISTANT DISTRIBUTION ENGINEER, age about 28, required by Canadian-owned public utility, 35,000 consumers. Permanent position with promotion dependent upon ability, opportunity and acquirement of Spanish. Salary U.S. $400 per month at exchange 2·5 to £1. Income tax 3%, no pension. Full particulars supplied to applicants giving concise details education and experience.—Apply, letter only (no telephone messages), to Mackness and Shipley, Consulting Engineers, Parliament Mansions, Abbey Orchard Street, London S.W.1. (G 193)

SENIOR or JUNIOR DRAUGHTSMAN required for work on electrical power resistances and large electrical heaters for industrial applications. Previous experience on this class of work is desirable but not essential.—Apply, giving full details, including age, technical qualifications, whether married or single and salary required to Box. No. 3137, Electrical Times. (G 156)

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London W.C.2, have an opening for a SALES REPRESENTATIVE in the Persian Gulf area. General electrical engineering experience essential and some knowledge of electrical contracting work and administration an advantage. Age about 30 preferred.—Apply to the Staff Manager (Ref. P.G.), giving full details of record and experience. (G 229)

THE ENGLISH ELECTRIC CO., LTD., Stafford, have vacancies for DRAUGHTSMEN to work on a wide variety of heavy electrical machines, including the largest water and steam-driven alternators and mill motors. These are interesting positions offering prospects of advancement.—Write quoting Ref. 74D, to Dept. C.P.S., 336/7 Strand, W.C.2. (G 88)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5568 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (G 13)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (G 20)

FISHER FOUNDRIES, LTD., Greet, Birmingham, have immediate capacity for machine moulded PRECISION CASTINGS in gunmetal and grey iron ¼ to 30 lb. All castings shot blasted.—Telephone: Birmingham, Victoria 0197. (G 16)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (G 17)

WANTED

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (G 8)

MODERN electrical machinery and plant, i.e. MERCURY ARC RECTIFIERS, H.T. and L.T. SWITCHGEAR, TRANSFORMERS, etc.
Must be good,—such as you yourselves would buy.
WHITEFIELD MACHINERY AND PLANT, LTD., Cobden Street, Salford 6. Tel. No.: PEN. 1373-4. (G 207)

WANTED. D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26 Britannia Walk, London N.1. (G 4)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady Street, Bethnal Green, E.1. (G 1)

WANTED. Large quantity of 4-in outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (G 2)

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Road, London E.C.1. (G 6)

WANTED, three-phase INDUCTION REGULATOR, alternatively Breco or Ferranti transformer type, rating 10 kVA or nearest.—Whitefield Machinery and Plant Ltd., Cobden Street, Salford 6. Tel.: Pen. 1373/4. (G 132)

FOR SALE

DOMESTIC APPLIANCES

80 reconditioned 1½-gall. storage type WATER HEATERS, Creda and Hotric. Sample forwarded for inspection. Price £6 each.—Isle of Man Electricity Board, Harcroft, Douglas. (G 194)

LIGHTING EQUIPMENT

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (G 14)

METERS

A.C.-D.C. QUARTERLY and SLOT METERS.—Brent Electrical Co., 6 Holmdale Gardens, London N.W.4. (G 5)

DON'T worry about your electricity bills. Fit 1/- slot electric meters for hotels, bed-sitters, etc. Prices from 50/-.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (G 21)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road London E.C.1. (G 10)

METERS, reconditioned, all types, quarterly credit single and three-phase 3-4 wire, 2½-100 amps. Prepayment a.c.-d.c. single, dual, triple coin, fixed or variable tariff. 2½-50 amps. Delivery ex-stock, guaranteed. Free catalogue lists 200 types.—The Electric Meter Co., Castle Circus House, Torquay. (G 208)

MOTORS & STARTERS

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22 (Forest Hill 2278-9). (G 3)

FLAMEPROOF MOTORS, M.G. SETS, D.C. MOTORS, GEARED MOTORS, A.C. MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS.

ELECTROPOWER COMPANY LIMITED

Kingsbury Works, Kingsbury Road, London, N.W.9.
Tel.: COLindale 4621/3.
Grams: Lektropowa, Hyde, London. (G 12p)

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Chiswick 5605, 67 Rothschild Road, W.4. (G 7)

A.C. and D.C. MOTORS, GENERATORS from stock.—A. Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (G 9)

ELECTRIC MOTORS for sale in first-class condition:—
Four only English Electric 4 h.p., 400-440 V, 3 ph. 50 c/s, revs. 955, protected type s.c. induction.
One only Laurence Scott and Electromotors Ltd., s.c. induction motor, 4 h.p., 400-440 V, 3 ph., 700 r.p.m.
One only Laurence Scott and Electromotors, Ltd., s.c. induction motor, 6 h.p., 400-440 V, 3 ph., revs. 2,900.
One only English Electric s.c. induction motor, 6 h.p., 400-440 V, 3 ph, revs. 950.
One only English Electric s.c. induction motor, 11 h.p., 400-440 V, 3 ph, revs. 720.
One only Crompton Parkinson slipring motor, with short circuiting gear, 12·5 h.p., 400-440 V, 3 ph, revs. 980.
Apply by letter only, Lyle and Scott Ltd., Lothian Street, Hawick, Scotland. (G 230)

TWO 3-h.p. B.T.H. infinitely variable 400/3/50 MOTORS 3 h.p. at 2,500 r.p.m., 0.4 at 625 r.p.m.—Electro-Mechanical Supplies, Ltd., 29-32 The Butts, Coventry. (G 133)

SWITCHGEAR

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Road, Wood Green, London N.22. Tel.: BOW. 7221. (G 11)

ONE open-type flat back d.c. SWITCHBOARD, 2,000 amperes capacity, fitted with single pole circuit breaker, voltmeter 0-400 V, ammeter 0-3,000 amperes, voltmeter fuses and single pole isolator. For price and delivery apply:
WHITEFIELD MACHINERY AND PLANT, LTD., Cobden Street, Salford 6. Tel. No.: PEN. 1373-4. (G 209)

TIME SWITCHES, new 15-day 10 amp. d.c., 15 amp. a.c., clockwork, on, off, once or twice per 24 hours. Trade 90s.—Box No. 3153, Electrical Times. (G 210)

TIME SWITCHES for sale. Reconditioned or new. 12 months' guarantee. Immediate delivery. Lists from: J. W. Hughes, 3 St. Thomas' Street, London Bridge, S.E.1. (Tel.: HOP. 2759). (G 22)

TRANSFORMERS & CONVERTERS

HACKBRIDGE oil-immersed TRANSFORMER, 11 kV 440 V 3-phase 50 cycles, delta-star, 750 kVA. Complete with Ferguson-Pailin type BV.4 oil-immersed circuit breaker. For price and delivery apply:
WHITEFIELD MACHINERY AND PLANT, LTD., Cobden Street, Salford 6. Tel. No.: PEN. 1373-4. (G 211)

UNCLASSIFIED

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements.—Blickvac, 505 Lordship Lane, S.E.22. Tel.: Forest Hill 7069. (G 18)

ONE Brown-Boveri Automatic VOLTAGE REGULATOR, type A2/1.
Two Lindley-Thompson outdoor type TRANSFORMERS, 11,000/433 V, 3 phase, 50 cycles, 250 kVA.
Whitefield Machinery and Plant, Limited, Cobden Street, Salford 6. Tel. No.: Pen. 1373-4. (G 196)

18 G.E.C. Type HO 6262 5 kW UNIT HEATERS.
6 Satchwell THERMOSTATS, Type Q.P.S.
6 Satchwell CONTACTORS, Type R.A.3.
18 G.E.C. Type HO.6265 WALL BRACKETS.
6 Memrex 500 V 30 amp. T.P. ISOLATORS.
17 M.E.M. 500 V 30 amp. D.P. ISOLATORS.
850 Standard Coolikon LIGHTING SHADES, 12 in. diameter.—Box No. 3187, Electrical Times. (G 219)

MISCELLANEOUS

CITY AND GUILDS (Electrical, etc.) on "No Pass—No Fee" terms. Over 95 per cent. successes.—For full details of modern courses in all branches of Electrical Technology send for our 144-page handbook FREE and post free.—B.I.E.T. (Dept. 39), 17 Stratford Place, London W.1. (G 15)

FREE! Brochure giving details of courses in ELECTRICAL ENGINEERING and ELECTRONICS, covering A.M.Brit.I.R.E., City and Guilds, etc. Train with the Postal Training College, operated by an Industrial Organisation. Moderate fees.—E.M.I. Institutes, Postal Division, Dept. E.T.29, 43 Grove Park Road, London W.4. (Associate of H.M.V.) (G 19)

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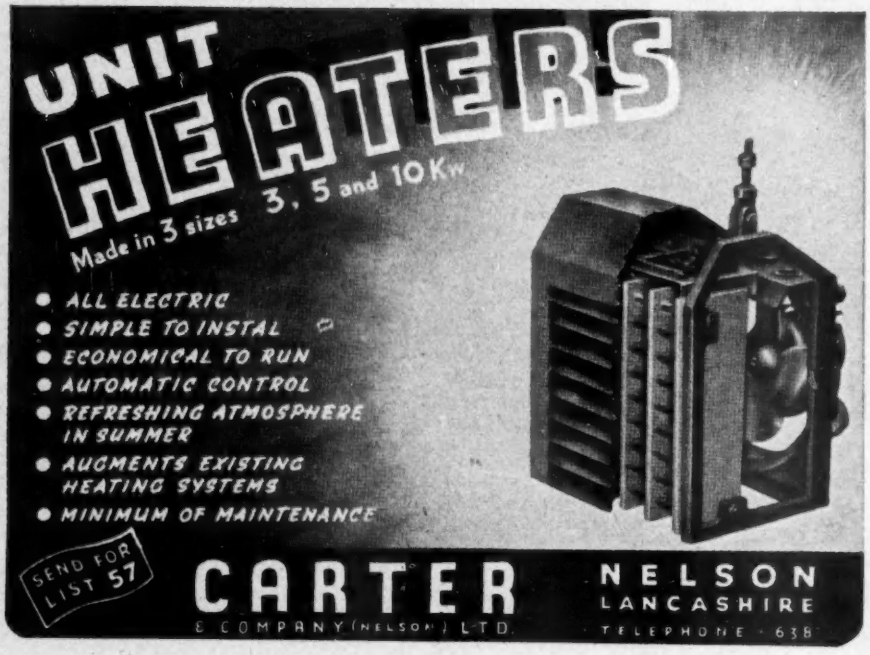
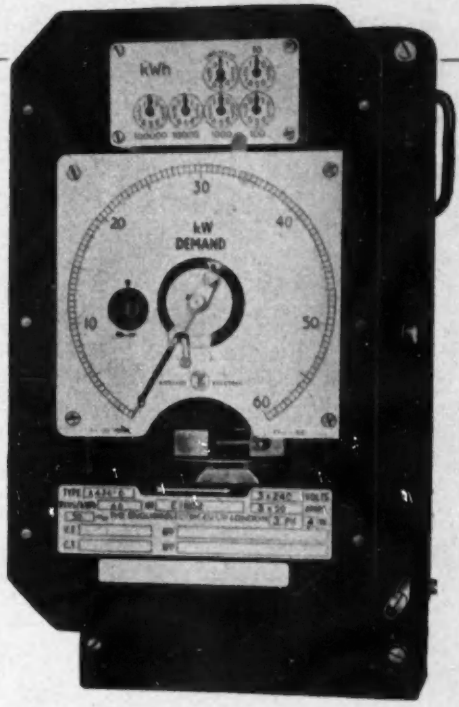


Maximum-demand indicators
Polyphase meters Types A42C—D and A43C—D



- Friction clutch employed for reset of driving pointer.
- Sealable reset button located to side of meter.
- Adjustable timing-cam to permit synchronisation of several mechanisms.
- Either internal or external time switches can be employed without additional components.
- Register dial independent of maximum demand attachment.
- 300° maximum demand scale compensated for reset interval.
- Mechanism electrically controlled and de-energised to reset.

'ENGLISH ELECTRIC'
polyphase meters

THE ENGLISH ELECTRIC COMPANY LTD., Queens House, Kingsway, London, W.C.2
Meter Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
4MM.18G3

See the English Electric advertisement for Transformers which appears on page 3 of this issue

Throughout

every stage of manufacture Howells motors are in the hands of conscientious workmen, each skilled in his own particular branch of the industry and each a member of a highly efficient team These are the factors on which their reputation for lasting and trouble-free service is based. There's more than meets the eye in

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(ELECTRIC MOTORS) LTD
HANLEY · STOKE-ON-TRENT
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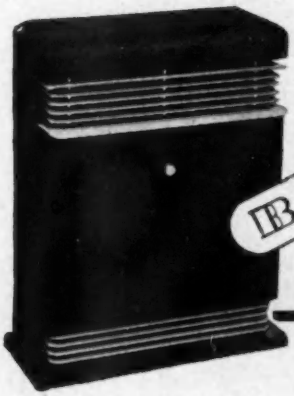
★ ***Ultra safe, ultra smart and ultra efficient . . . the B.N.E. Model P.20 Convector.***



The stimulating comfort of the convector-warmed waiting room . . . the efficiency of the office warmed *before* staff arrive by a time-switch controlled Convector . . . the smart appearance of the latest B.N.E. Model P.20—these are the selling points that can bring you profits. Your latent customers may not realise the advantages of the electric convection heater with its automatic thermostat and facility for time-switch control. Tell them ! Show them how *they* will benefit. There is a lot of business among shopkeepers and professional and business men if you back your story with the smart B.N.E. Convectors.

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The Domestic Appliance Section of JOHNSON & PHILLIPS LTD.
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SWITCH BLOCKS
built of KILN DRIED *timber*
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BOILER AVAILABILITY INCREASED
ELECTRO-MECHANICAL OPERATION with SEQUENCE CONTROL

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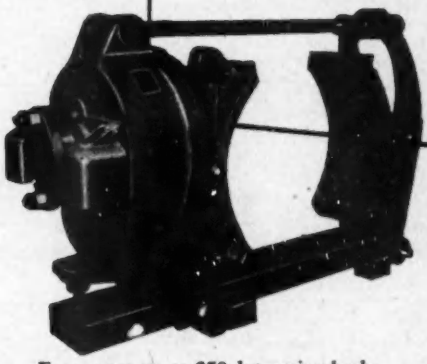
IGRANIC
MAGNETIC DEVICES.
TYPE 'M' BRAKE.



For motors up to 350 h.p. using brake drums 8 ins. to 30 ins. diameter.

FOR D.C. SERVICE
(OR A.C. WITH RECTIFIER)
EMBODYING DIRECT ACTION
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ALL TOGGLES

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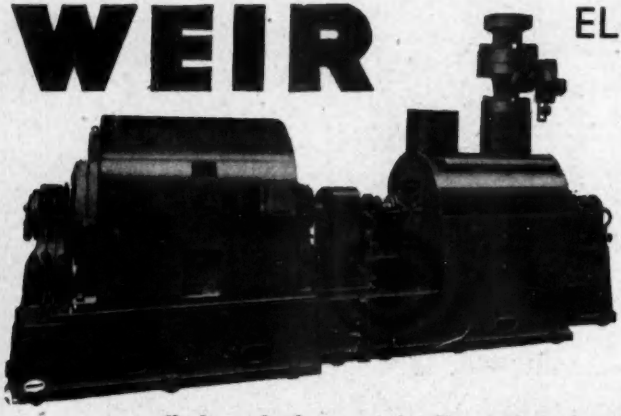

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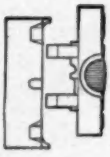

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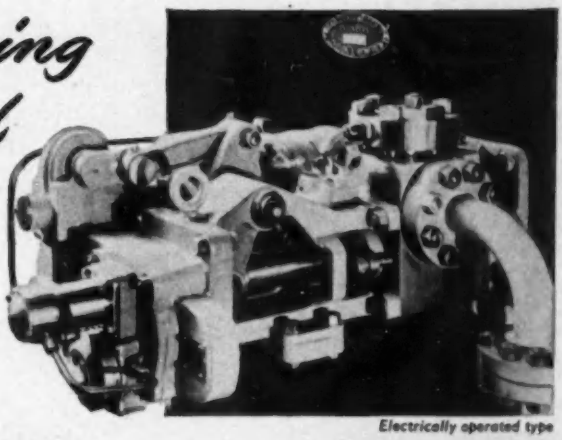
Makers of many types of Rectifier Equipment

Soot Blowing Simplified with the new

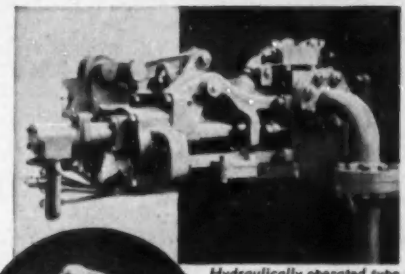


Electrically operated type

BABCOCK

"Unidirectional"

SOOT BLOWER



Hydraulically operated type

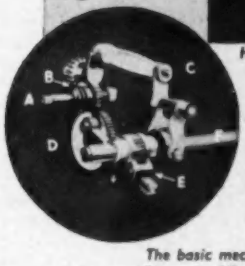
The Babcock "Unidirectional" retractable soot blower represents a major advance in the simplification of soot blowing systems using automatic sequence control.

The complete operation of traversing the nozzle into the furnace, rocking it over the blowing angle the required number of times and then retracting, is carried out by a robust mechanism of new design, driven—without the use of clutches—by a simple *unidirectional* hydraulic or electric motor requiring only "on-off" control.

Sequence timing is reduced and elimination of such complications as reversing contactors brings extreme simplicity of control and great reliability.

Simple-harmonic motion of the blower nozzle ensures constant cleaning effect over the whole blowing arc by compensating for variation in the nozzle/tube distance.

The unidirectional mechanism and simplified controls have proved in service to be an outstanding success; and apart from the operating mechanism, the new type of blower retains all the well-known features of the standard Babcock retractable soot blowers.



The basic mechanism; showing how a unidirectional drive to shaft A causes traversing of the blower spindle F, via worm and wheel B and linkage C, while at the same time producing rocking of the spindle, through pinion D operating rack and pinion E.

The Babcock "Unidirectional" soot blower, which is covered by British and foreign patents, has been developed for electrical and hydraulic control in collaboration respectively with The British Thomson-Houston Co. Ltd. and the Lockheed Industrial Hydraulics Division of Automotive Products Company Ltd.

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HEAVY DUTY LAMPHOLDER
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This patent bayonet holder will operate continuously at 10 amps with safety, and will reduce maintenance charges. *Specially designed for Railway conditions.*

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POWER Transformers

C.S.A. APPROVED
10 VA to 100 kVA
Open, Enclosed, Oil Cooled, D.W. and Auto
For
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SPEEDS UP TO 6,000 R.P.M.
SEND FOR LEAFLET 187
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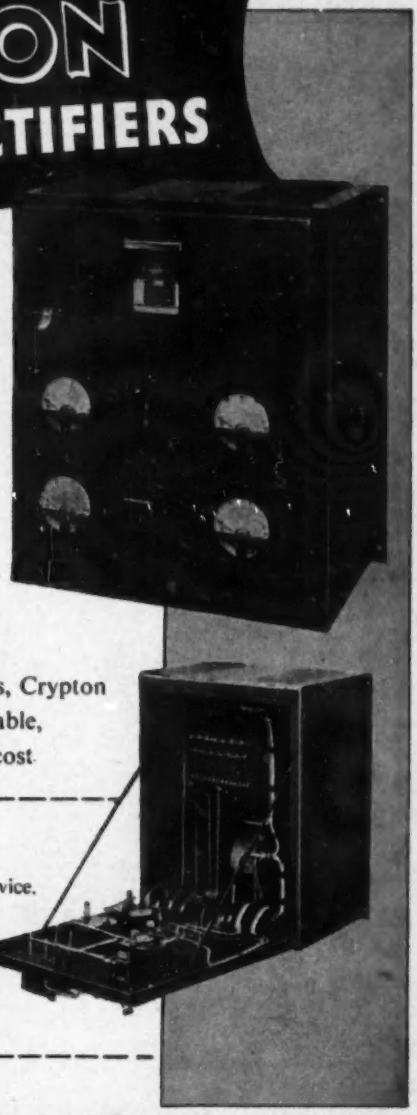
TURNRIGHT CONTROLS LTD., West Hill, Hoddesdon, Hertfordshire

CRYPTON
SELENIUM RECTIFIERS



D.C. POWER SUPPLY FROM A.C. MAINS

for

BATTERY CHARGING
ELECTRO MAGNETIC APPARATUS
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CATHODIC PROTECTION
ELECTROLYSIS
ENGINE STARTING
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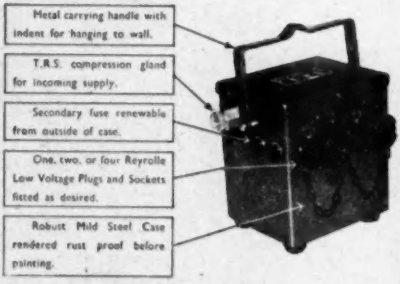
Portable TRANSFORMER
From STOCK


Metal carrying handle with indent for hanging to wall.
T.R.S. compression gland for incoming supply.
Secondary fuse renewable from outside of case.
One, two, or four Reyrolle Low Voltage Plugs and Sockets fitted as desired.
Robust Mild Steel Case rendered rust proof before painting.

SIZES AVAILABLE:
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Primary Voltages: 200/250 Volts.
Secondary Voltages: 12, 25, 50, 110 Volts.

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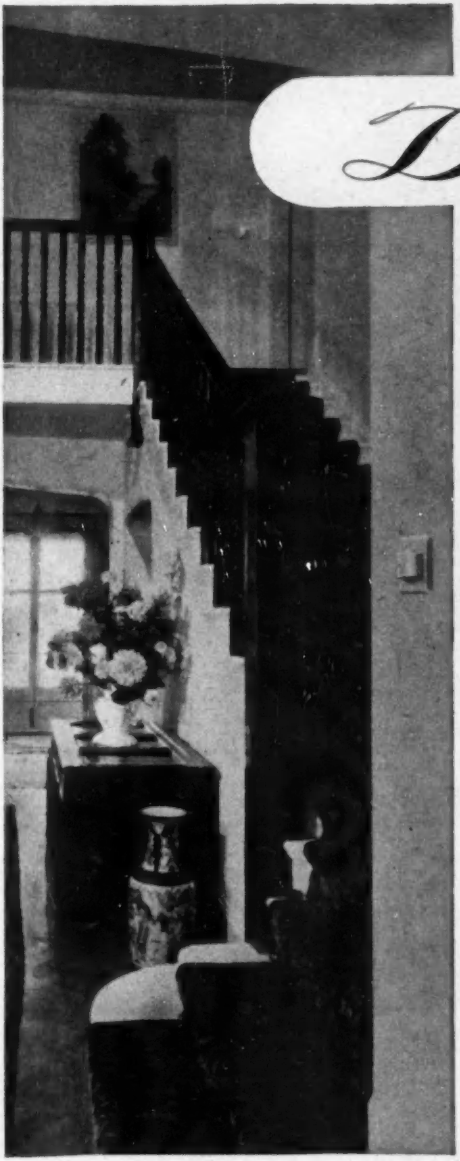

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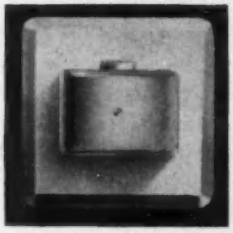

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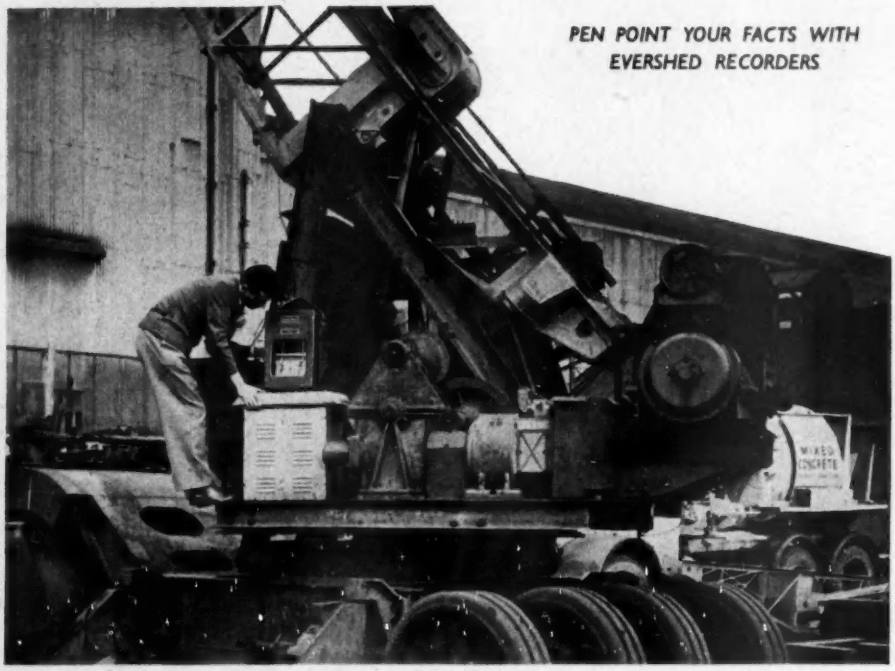

RECORDING MOBILE CRANE OPERATIONS

The Ransomes and Rapier mobile crane illustrated here was fitted with a special jib for handling cargo. To ensure the suitability of the motor for the special duty involved an Evershed Chart Recorder was used during trials to record the current taken by various motors under varying conditions. This is only one instance of the many uses to which this famous British engineering firm have put Evershed Recorders in its investigation of motor loading under actual working conditions, which also helps to discover if the operator is following the correct sequence of loading or excavation.

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Printed in England for the Proprietors, THE ELECTRICAL TIMES, LTD., by SUN PRINTERS, LTD., London and Watford, Herts, and published at Sardinia House, Sardinia Street, London W.C.2. December 24, 1953.

For waste heat recovery at highest pressures

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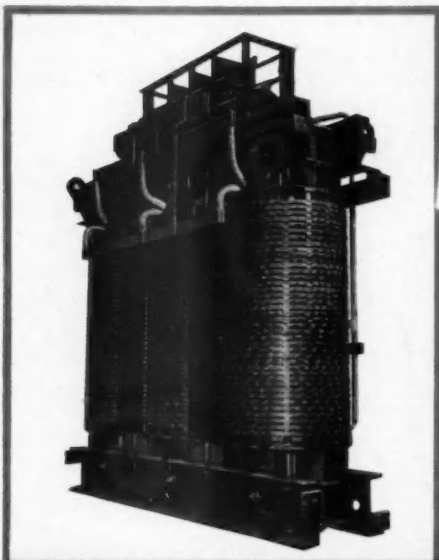

Denis Ferranti Group

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DELIVERY

POWER TRANSFORMERS

The illustration shows a 3,750 kVA 11,000/3300/2200 volts 50 cycles 3-phase Transformer. Similar construction is employed up to 10,000 kVA. Larger Transformers are built up to 30 MVA

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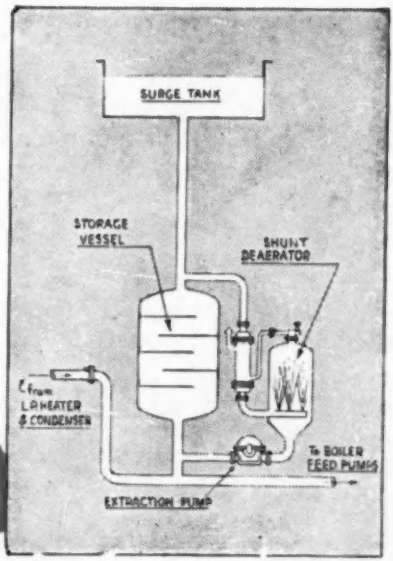
SIMPLE
RELIABLE
ECONOMICAL

COMPLETELY AUTOMATIC IN ACTION

Available in all sizes.
Can be installed to work with existing feed systems.



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